Configuring BayStack Remote Access

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Site Manager Software Version 6.20

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Bay Networks

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About This Guide

Read this guide if you are responsible for connecting a Bay Networks® BayStack™ Access Node (AN®), Access Node Hub (ANH™), or Advanced Remote Node™ (ARN™) router to a managed network.

If you want to	Go to
Learn about the software tools and options for configuring remote access and choose the router's startup configuration	Chapter 1
Set up a UNIX workstation as a BootP server	Chapter 2
Configure Site Manager for network booting	Chapter 3
Configure the router for network booting	Chapter 4
Manage ANH repeater ports	Chapter 5
Obtain information about Site Manager parameters (this is the same information you obtain using Site Manager online Help)	Appendix A
Troubleshoot network boot problems or review implementation hints and notes	Appendix B
Gather information required to complete the Quick-Start installation procedure, and start the Technician Interface Quick-Start script	Appendix C

Before You Begin

Before using this guide, you (or the person responsible at the router site) must install the BayStack router hardware, as described in one of the following guides:

- *Installing and Operating BayStack AN and ANH Systems*
- *Installing and Operating BayStack AN/DC and ANH-8/DC Systems*
- *Installing and Operating BayStack ARN Routers*
- *Installing and Operating BayStack ARN/DC Routers*

Make sure that you are running the latest version of Bay Networks Site Manager and BayRS™ software. For instructions, see *Upgrading Routers from Version 7–11.xx to Version 12.00*.

Conventions

angle brackets (< >)	Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: if command syntax is **ping** *<ip_address>*, you enter **ping 192.32.10.12**
bold text	Indicates text that you need to enter, command names, and buttons in menu paths. Example: Enter **wfsm &**
	Example: Use the **dinfo** command.
	Example: ATM DXI > Interfaces > **PVCs** identifies the PVCs button in the window that appears when you select the Interfaces option from the ATM DXI menu.
brackets ([ ])	Indicate optional elements. You can choose none, one, or all of the options.
ellipsis points	Horizontal (. . .) and vertical (⋮) ellipsis points indicate omitted information.
italic text	Indicates variable values in command syntax descriptions, new terms, file and directory names, and book titles.
quotation marks (“ ”)	Indicate the title of a chapter or section within a book.
`screen text`	Indicates data that appears on the screen. Example: `Set Bay Networks Trap Monitor Filters`
separator (>)	Separates menu and option names in instructions and internal pin-to-pin wire connections. Example: Protocols > AppleTalk identifies the AppleTalk option in the Protocols menu.

vertical line (|)	Indicates that you enter only one of the parts of the command. The vertical line separates choices. Do not type the vertical line when entering the command. Example: If the command syntax is **show at routes | nets**, you enter either **show at routes** or **show at nets**, but not both.

Note: In this guide, the term *BayStack router* applies to AN, ANH, or ARN routers.

Acronyms

ANSI	American National Standards Institute
ARP	Address Resolution Protocol
AUI	Attachment Unit Interface
BofL	Breath of Life
BootP	Bootstrap Protocol
BootPD	Bootstrap Protocol Daemon
BRI	Basic Rate Interface
CCITT	International Telegraph and Telephone Consultative Committee (now ITU-T)
CHAP	Challenge Handshake Authentication Protocol
CSMA/CD	carrier sense multiple access/collision detection
DCE	data communications equipment
DLCI	data link connection identifier
DLCMI	Data Link Control Management Interface
DSU/CSU	data service unit/channel service unit
DTE	data terminal equipment
FTP	File Transfer Protocol
HDLC	high-level data link control
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
IPX	Internet Packet Exchange
ISDN	Integrated Services Digital Network

ISO	International Organization for Standardization
ITU-T	International Telecommunications Union–Telecommunications sector (formerly CCITT)
LAN	local area network
LMI	Local Management Interface
LQR	Link Quality Reporting
MAC	media access control
MAU	media access unit
MIB	Management Information Base
NBMA	nonbroadcast multi-access
OSI	Open Systems Interconnection
OSPF	Open Shortest Path First (protocol)
PAP	Password Authentication Protocol
PCMCIA	Personal Computer Memory Card International Association
PPP	Point-to-Point Protocol
PVC	permanent virtual circuit
RARP	Reverse Address Resolution Protocol
RFC	Request for Comments
RIP	Routing Information Protocol
RMON	remote monitoring
SAM	System Administration Manager
SIMM	single in-line memory module
SMDS	switched multimegabit data service
SMIT	System Management Interface Tool
SNMP	Simple Network Management Protocol
STP	shielded twisted pair
TCP/IP	Transmission Control Protocol/Internet Protocol
Telnet	Telecommunication network
TFTP	Trivial File Transfer Protocol
TFTPD	Trivial File Transfer Protocol Daemon
UDP	User Datagram Protocol
WAN	wide area network

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Chapter 1
Understanding Tools and Options

The AN/ANH and ARN families of routers (referred to as *BayStack routers* in this guide) connect multiprotocol workgroups to corporate backbone networks. This chapter provides an overview of the software and procedures for configuring and managing BayStack router remote access.

Topic	Page
Network Configuration and Management Tools	1-1
BayStack Router Startup Procedure	1-2
Preparing for the Initial Startup	1-13
Selecting the Routine Startup Option	1-16
Steps for Completing Startup Options	1-18

Network Configuration and Management Tools

There are several tools available for configuring and managing BayStack routers:

- Graphical, SNMP-based network management tools within Optivity Internetwork™, a component of the Bay Networks Optivity Enterprise™ application suite:
  - -- Site Manager, a router management, configuration, and monitoring application
  - -- RouterMan™, a real-time router performance and status reporting application
  - -- PathMan™, a diagnostic application for determining the complete data path between two network devices

- Router configuration and management tools included with BayRS:
  - -- Technician Interface, a command-line interface that operates in router memory. Technician Interface commands and scripts provide real-time SNMP-based Management Information Base (MIB) access from an attached or remote (modem or Telnet) management console.
  - -- AN Monitor, a command-line interface to the BayStack router diagnostic firmware. You use the AN Monitor to configure AN, ANH, and ARN boot configurations.
- Quick2Config®, a Microsoft Windows-based application that you can use to create or modify router configuration files.

Note: If you plan to use Quick2Config to configure a BayStack router, see *Configuring Your Router Using the Quick2Config Tool.*

This guide describes how to connect BayStack routers to a managed network using Site Manager, and how to set the startup configuration using the AN Monitor and Technician Interface.

BayStack Router Startup Procedure

The following sections describe the software files and configuration options involved in the BayStack router startup procedure:

- Startup Files
- Startup Options

Startup Files

Before it can operate, a router must boot a *software image.* The software image contains an operating-system kernel file that supports the router platform, plus a group of executable files that support the major networking protocols and dial-up services that the network requires. Booting the router is the process of installing and using the applicable software image files.

To bridge and route traffic, a router also needs a *configuration file* that is tailored to the network. A configuration file is a binary system file that contains hardware and software configuration data.

Bay Networks ships the software image for a BayStack router on a PCMCIA flash memory card, along with a default configuration file named *config*. The ARN software image is named *arn.exe*. The AN/ANH software image is named *an.exe*. Table 1-1 describes the executable startup files contained in the AN/ANH and ARN software images.

Table 1-1. BayStack Router Startup Files

Startup File Name	Description
krnl_arn.exe	ARN operating-system kernel
krnl_an.exe	AN/ANH operating-system kernel
Application files	Executable files needed to perform the functions specified in the configuration file. All application files have *.exe* file-name extensions. (For example, the router needs an *ipx.exe* executable file to run IPX.)
String files	Compressed ASCII files needed when you use the Bay Networks Technician Interface to display the event log or MIB object names. Groups of string files remain in compressed format until needed.

Startup Options

A router obtains the software image and configuration files that you want it to use during startup.

Startup options allow a BayStack router to retrieve startup files either over the network or from the file system stored in local flash memory. Obtaining startup files from the router file system is called *local booting*. Obtaining one or more startup files over the network is called network booting, or *netbooting*.

You use one of four boot options to complete a startup procedure. Table 1-2 summarizes these startup options. "The Boot Process" on page 1-5 describes how local and network booting works.

For initial startup, the BayStack router is configured for a default option, but you can change the default (see "Preparing for the Initial Startup" on page 1-13). To select the startup option for routine operation, see "Selecting the Routine Startup Option" on page 1-16. To review the steps for configuring and completing a startup option, see "Steps for Completing Startup Options" page 1-18.

Table 1-2. Summary of BayStack Router Startup Options

Boot Option	Image File Source	Configuration File Source	Description	Requirements
EZ-Install	Local (PCMCIA flash memory card)	Network (serial interface only)	The default option for initial startup. The BayStack router boots the software image files in local flash memory, then obtains its configuration file from a remote workstation on a Frame Relay network that is configured as a Bootstrap Protocol (BootP) server. The BayStack router saves the configuration file to the flash memory card for future use.	• Serial connection configured with the high-level data link control (HDLC) or Frame Relay protocol • BootP server that contains the configuration file
Netboot	Local or Network	Local or Network	The BayStack router obtains at least one startup file from a remote workstation that is configured as a BootP server.	• Management console • BootP server that contains at least one startup file • Connection over a Frame Relay or HDLC (serial or DSU/CSU), Ethernet, or token ring (ARN only) interface
Directed Netboot	Local or Network	Local or Network	The BayStack router obtains at least one startup file from a remote workstation that is configured as a Trivial File Transfer Protocol (TFTP) server. You must specify the IP address of the TFTP server and the complete path to the startup file(s) before booting.	• Management console • TFTP server that contains at least one startup file • Connection over a Frame Relay or HDLC (serial or DSU/CSU), Ethernet, or token ring (ARN only) interface
Local Boot	Local	Local	The BayStack router boots from the software image and generic startup configuration files stored in flash memory. You create a customized configuration file by running the Quick-Start script.	• Management console • Installed flash memory card that contains the startup files

The Boot Process

The following sections describe the boot process for the Local Boot and Netboot startup options:

- Netboot Process (EZ-Install, Netboot, or Directed Netboot)
- Local Boot Process

Netboot Process

When booting over the network using EZ-Install, Netboot, or Directed Netboot, the BayStack router completes the following tasks:

1. Determines its IP address
2. Obtains the operating-system kernel file and/or configuration file by communicating with a configured BootP server on the IP network
3. Reboots, using the newly transferred kernel file
4. Obtains application and string files over the network as it needs them
5. Begins bridging and routing traffic as specified in the configuration file

The following sections describe in more detail the key steps in this process:

- Obtaining an IP Address Manually (Netboot or Directed Netboot) or Obtaining an IP Address Automatically (EZ-Install)
- Obtaining the Kernel and Configuration Files

Obtaining an IP Address Manually (Netboot or Directed Netboot)

For Netboot and Directed Netboot, you configure the IP address manually. Chapter 3 describes how to use Site Manager to configure netboot interfaces. Chapter 4 describes how to configure netboot using the Technician Interface.

Obtaining an IP Address Automatically (EZ-Install)

During the EZ-Install process, the BayStack router obtains its IP address as follows:

1. When you turn on the BayStack router, it runs a set of diagnostic tests.
2. The BayStack router sends a BootP request to the upstream router for an IP address and subnet mask.

The BayStack router sends the BootP request through all serial ports at approximately the same time, using the following protocols:

- Bay Networks Standard Point-to-Point Protocol (PPP) using high-level data link control (HDLC) encapsulation
- Frame Relay Annex D
- Frame Relay Local Management Interface (LMI)
- Frame Relay Annex A

Note: The upstream router must have a circuit running Bay Networks Standard PPP using HDLC or a Frame Relay permanent virtual circuit (PVC).

If the BayStack router does not receive a response to the first BootP request, it issues a second request.

If the BayStack router does not receive a response in approximately four minutes, it boots the image and configuration files in its local file system, as described in "Local Boot Process" on page 1-12.

3. The first interface on the upstream router to receive the BootP request responds.
4. The upstream router obtains the IP address of the BayStack router's serial interface. The protocol configuration of the upstream router determines whether it calculates or requests the IP address, as follows:

   -- A Frame Relay PVC in direct access mode or a Bay Networks Standard PPP interface calculates the IP address by adding 1 to the IP address of the interface that received the request.

   For example, in Figure 1-1, the upstream router's interface address is 192.32.1.1. This means that the upstream router calculates 192.32.1.2 as the BayStack router's IP address.

Note: If the IP address plus 1 equals a broadcast address, the upstream router calculates the IP address by subtracting 1. For example, if the IP address of the upstream router's interface is 7.255.255.254, the IP address of the BayStack router is 7.255.255.253.

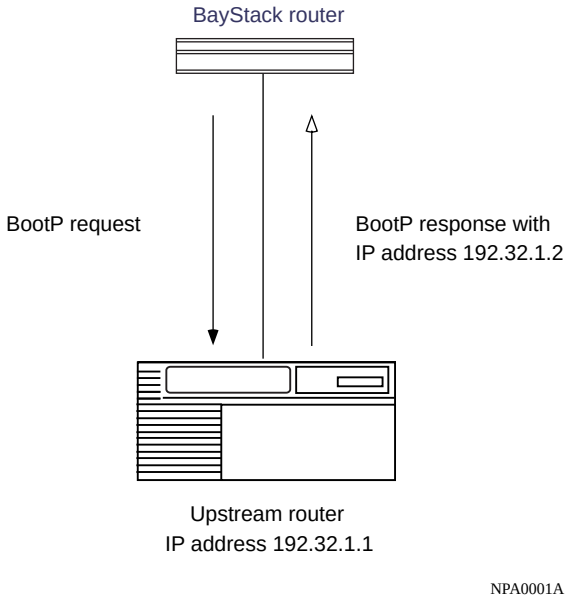

Figure 1-1. Calculating an IP Address (Direct Access PVC or Standard PPP)

-- A Frame Relay PVC in group access mode refers to its BootP client interface table to find an associated IP address for the BayStack router.

Note: The BootP client interface table contains a data link connection identifier (DLCI) and IP address pair for each PVC. You use Site Manager to create this table when you follow the instructions for setting up routing paths in Chapter 3.

For example, in Figure 1-2, the BayStack router sends BootP requests for its IP address. The upstream router receives the request on PVC 31. The upstream router determines the DLCI, refers to DLCI 31 in the BootP client interface table, finds the IP address, and sends a BootP response containing the IP address back to PVC 31.

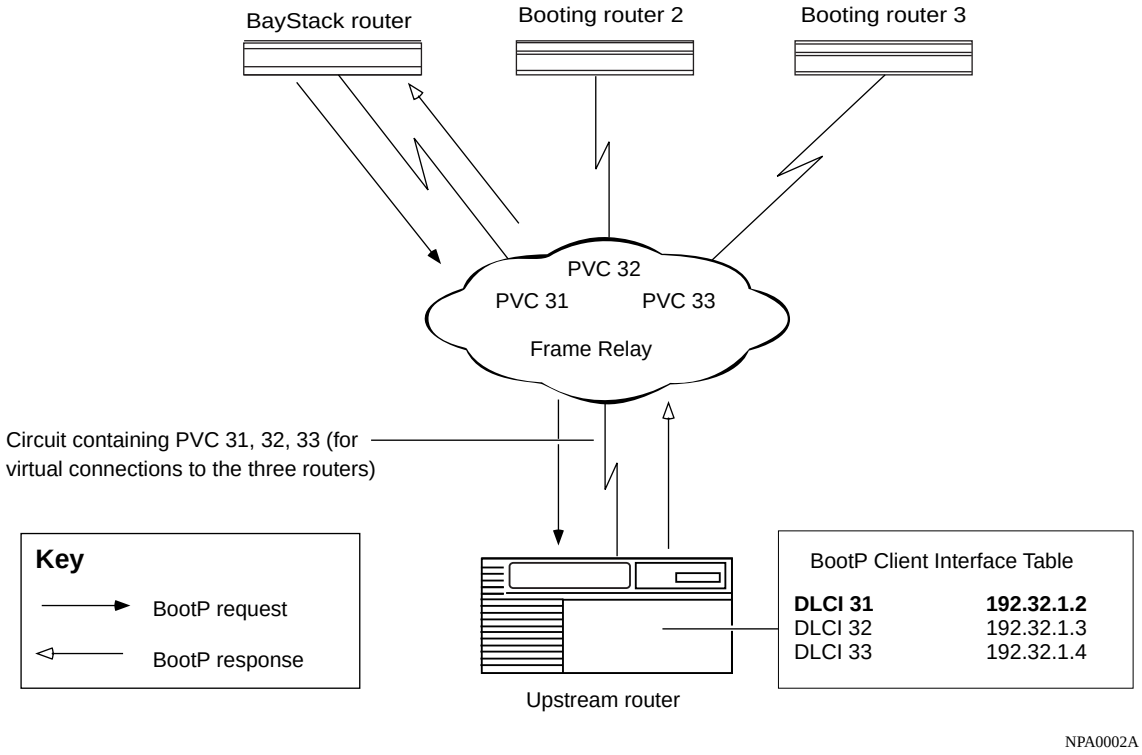

Figure 1-2. Requesting an IP Address from the BootP Server (Group Access PVC)

5. The upstream router sends the IP address and subnet mask to the BayStack router in a BootP response message.
6. The BayStack router assigns the IP address and subnet mask to any serial interface that receives a BootP response.
7. The BayStack router stores these IP addresses, along with the IP address of the next-hop router, in RAM.

   If more than one serial interface receives a BootP response, the BayStack router assigns an IP address to each interface.

Obtaining the Kernel and Configuration Files

With a known IP address, the BayStack router can obtain its operating-system kernel and configuration files over the network. The procedure is the same for EZ-Install, Netboot, and Directed Netboot.

1. The BayStack router sends a BootP request for the path names of the startup files.

   The BayStack router issues the request simultaneously through all serial (COM), Ethernet, and token ring (ARN only) interfaces that have IP addresses. The BayStack router issues this request periodically for approximately three minutes, regardless of whether a cable is connected.

2. A BootP server responds to the BayStack router's request with the directory path names (Figure 1-3).

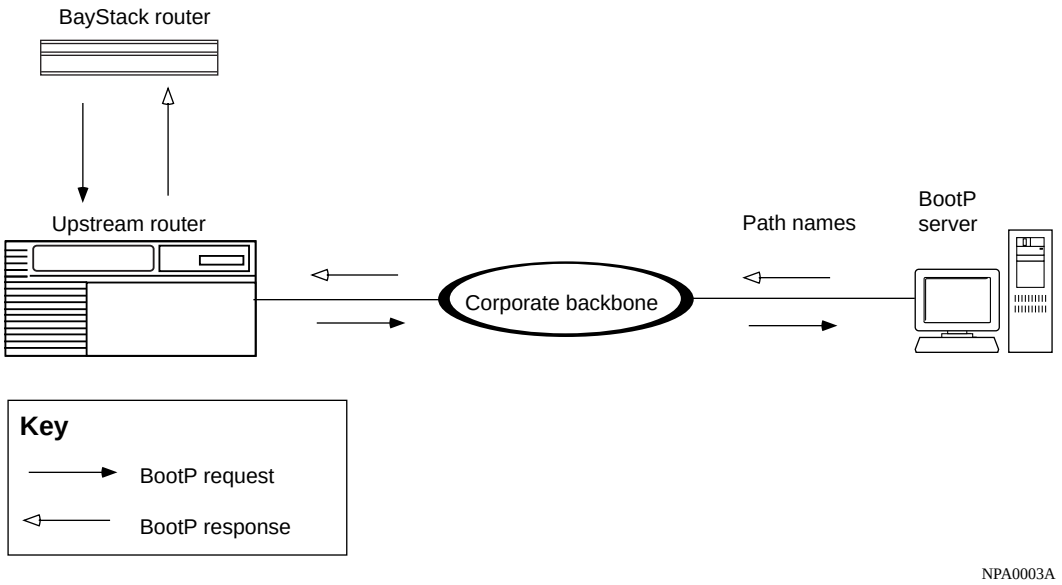

Figure 1-3. Obtaining the Path Names of the Kernel and Configuration Files

   The first router interface that processes the BootP response acts as the TFTP client in the remaining steps.

3. The BayStack router stops sending BootP requests.

4. The BayStack router sends a TFTP request for the configuration file.
5. The BootP server uses TFTP to transfer the configuration file (Figure 1-4).

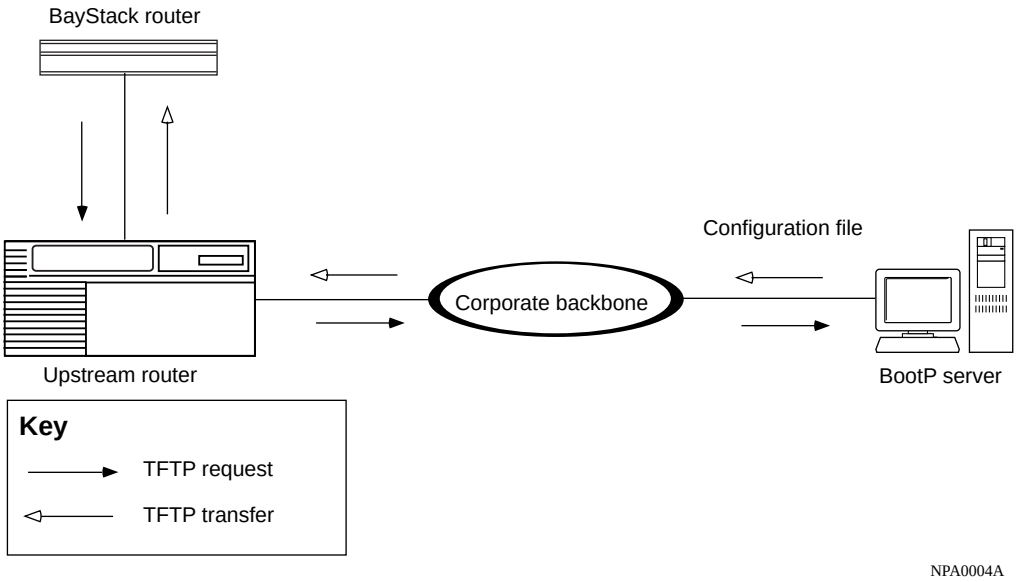

Figure 1-4. Obtaining the Configuration File

6. The BayStack router sends a TFTP request for the kernel file.
7. The BootP server uses TFTP to transfer the kernel file (Figure 1-5).

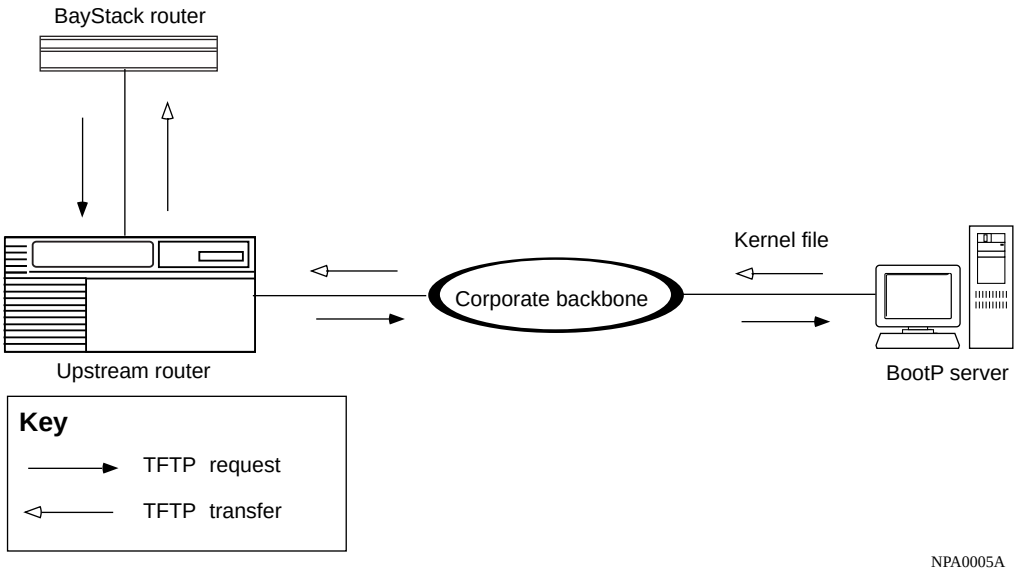

Figure 1-5. Obtaining the Kernel File

8. The BayStack router boots the kernel.
9. The BayStack router uses TFTP to obtain application and string files as it needs them.
10. The BayStack router begins bridging and routing network traffic as specified in the configuration file.

The BayStack router can continue to request files, even after it begins bridging and routing traffic.

If a failure occurs in steps 1 through 8, the BayStack router attempts to boot locally.

Local Boot Process

When the BayStack router boots locally, it reads the kernel, application, and string files embedded in the *an.exe* or *arn.exe* software image file on the local PCMCIA flash memory card.

When you use Local Boot as the initial boot option, you boot a default (generic) configuration file. You must then run the Quick-Start installation script to customize the default configuration file. Running the installation script establishes an IP network interface between the BayStack router and a Site Manager workstation (Figure 1-6).

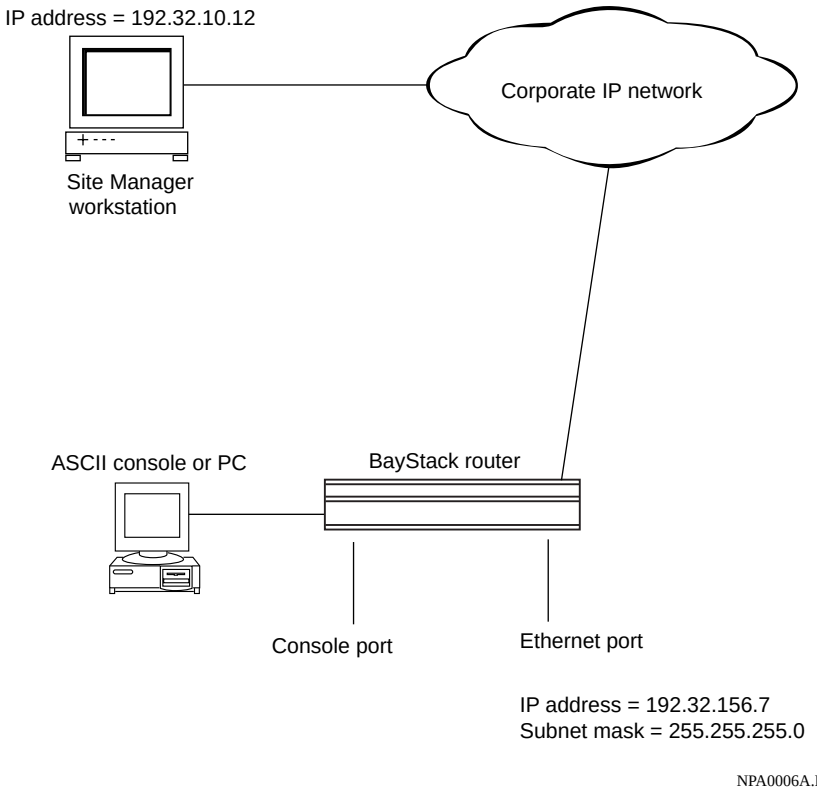

Figure 1-6. Establishing an IP Network Interface

Appendix C briefly describes the procedure for customizing the default configuration file, provides worksheets for preparing to run the procedure, and explains how to begin the Quick-Start installation script.

Preparing for the Initial Startup

The first time you turn on the BayStack router, it begins a startup procedure to obtain the files it needs to operate routinely over the network. For the procedure to be successful, you must first complete the following tasks:

- Select the initial startup option (see the next section,"Selecting the Initial Startup Option")
- Set up the network to support the startup option (see Chapter 3)
- For options other than EZ-Install, configure the BayStack router for the startup option (see Chapter 4)
- Provide a tailored configuration file for the BayStack router (see "Providing a Tailored Configuration File" on page 1-15)
- Coordinate the initial startup with a person at the BayStack router site

  The person at the BayStack router site installs the hardware and cables, and then initiates the appropriate startup option. The BayStack router hardware installation guide explains these tasks in detail.

Note: As an alternative to another person performing the initial startup at the BayStack router site, you can perform these tasks using a modem connection.

Selecting the Initial Startup Option

By default, the EZ-Install procedure begins when you turn on the BayStack router. You can change the initial startup option to Local Boot or Netboot.

This section reviews the options for initial startup and lists the requirements for each startup option. "Selecting the Routine Startup Option" on page 1-16 provides similar information for routine operation. "Steps for Completing Startup Options" on page 1-18 describes the procedure for configuring a startup option.

Note: Even if you use the default option, EZ-Install, Bay Networks strongly recommends that you connect a modem or a console to the BayStack router for initial startup. With a console connection, you can issue commands to the BayStack router and display messages. This is very useful if you have network problems after installation.

EZ-Install

EZ-Install is the easiest option for the person at the BayStack router site to perform, because the BayStack router automatically begins the procedure at startup, and the network automatically supplies the IP address and configuration file.

The EZ-Install procedure requires the following at initial startup:

- A communications link between the BayStack router and an upstream router over an HDLC or Frame Relay interface
- A BootP server that contains a customized configuration file for the BayStack router

If EZ-Install fails in an initial startup attempt, one of the following occurs:

- An AN or ANH router attempts to boot once using the Local Boot option. If both boot attempts fail, you must troubleshoot the problem and reboot the router as described in Appendix B.
- An ARN router first tries to local boot, and then tries to netboot. The ARN continuously attempts to local boot and netboot until it boots successfully, you turn off the ARN, or you interrupt the process in one of the following ways:
  - -- Press the Reset button on the ARN back panel
  - -- Type the [Control]-c break sequence at the management console

Local Boot

The Local Boot procedure requires the following at initial startup:

- An installed PCMCIA flash memory card that contains the software image file and a generic configuration file
- A local console or modem connection with the BayStack router

When you use Local Boot as the initial boot option, the Site Manager connection is not yet in place. The BayStack router boots using the generic configuration file; then, you must run the Quick-Start installation script to customize the configuration file and save it locally (see Figure 1-6 on page 1-12).

See the description of the Quick-Start installation procedure in Appendix C.

Netboot

The Netboot procedure requires the following at initial startup:

- A communications link between the BayStack router and an upstream router over an Ethernet, HDLC, Frame Relay, or token ring (ARN only) interface
- A local console or modem connection with the BayStack router
- A BootP server that contains the software image file (*arn.exe* for the ARN or *an.exe* for the AN/ANH) or a network configuration file (*config*) customized for the BayStack router
- An IP address assigned to the BayStack router's boot interface

Providing a Tailored Configuration File

Since the BayStack router ships with a generic configuration file on the PCMCIA flash memory card, you must tailor that file to your network before the BayStack router can bridge and route traffic.

You can provide the BayStack router with a tailored configuration file during the initial startup in one of the following ways:

- Place a tailored configuration file on the server for the BayStack router to download during EZ-Install or another netboot procedure.

  See "Preparing Configuration and Image Files" in Chapter 3 for information about creating a tailored configuration file.

- Allow the BayStack router to start using the generic configuration file during a Local Boot procedure; then, use the Technician Interface Quick-Start installation script to configure one or more interfaces for IP so that the BayStack router can connect to Site Manager (or another network management tool).

  The Quick-Start procedure initially tailors the default configuration file; use Site Manager to complete the configuration. See Appendix C for more information.

Selecting the Routine Startup Option

This section provides information to help you select the boot configuration for routine startup operations.

Recommendations

Bay Networks recommends that you do the following:

- Maintain the complete software image file (*an.exe* or *arn.exe*) on the local file system at all times, in case the network connection to the BootP server goes down and the BayStack router needs to use Local Boot for startup.
- Set up the network to support Netboot even if you plan to use the Local Boot option. With the network set up to support Netboot, you can boot the BayStack router over the network for some procedures and boot it locally for others.

Netboot

Netboot takes longer than the other startup options, but has many benefits.

Note: Over a low-speed WAN, or after configuring the BayStack router to run several protocols, netbooting can take up to 15 minutes. It takes less time to netboot only the kernel file or configuration file.

Using Netboot for routine startups allows you to:

- Manage software image and configuration files from a remote location by storing them on the BootP server

  This option greatly simplifies the management of remote routers by allowing you to keep the startup files up-to-date in a single location -- the BootP server.

- Minimize the need to maintain the BayStack router's local file system

  When the BayStack router obtains files from a BootP server, it stores them in memory, not in its file system, reducing the need for frequent file-system compactions. (See *Using Technician Interface Software* or *Configuring and Managing Routers Using Site Manager* to learn about compacting a file system.)

- Restore a corrupted file system

  The BayStack router's file system resides on an installed flash memory card. With Netboot enabled, the BayStack router can still boot over the network if the local files become corrupted. (When the BayStack router reboots due to a reset or power loss, it automatically boots the configuration and image files over the network if it cannot find intact files locally.)

- Obtain application and string files from the BootP server as the BayStack router needs them

  Obtaining these files individually, rather than obtaining the entire *an.exe* or *arn.exe* file, reduces line costs and the use of flash memory space.

The Netboot procedure requires the following at initial startup:

- A communications link between the BayStack router and an upstream router over an Ethernet, HDLC, Frame Relay, or token ring (ARN only) interface
- A local console or modem connection with the BayStack router
- A BootP server that contains the operating-system kernel (*krnl_arn.exe* for the ARN or *krnl_an.exe* for the AN/ANH) or a network configuration file customized for the BayStack router
- An IP address assigned to the BayStack router boot interface

Directed Netboot

The Directed Netboot procedure requires the following at initial startup:

- A communications link between the BayStack router and an upstream router over an Ethernet, HDLC, Frame Relay, or token ring (ARN only) interface
- A local console or modem connection with the BayStack router
- A TFTP server that contains the kernel file (*krnl_arn.exe* for the ARN or *krnl_an.exe* for the AN/ANH) or a network configuration file customized for the BayStack router

Compared with Netboot, Directed Netboot offers the following advantages:

- Creates less network traffic
- Is generally faster

Directed Netboot is usually reserved for starting the BayStack router after the initial startup because you need to know the exact location of the startup files. During Directed Netboot, the BayStack router transfers files from a TFTP server directly, bypassing negotiation with a BootP server for the IP address and path names of the startup files.

Local Boot

Local-booting the startup files for routine startups allows you to:

- Minimize the time it takes the BayStack router to boot

  In most configurations, however, the difference between the two options is only a few seconds. Typically, local-booting takes two to three minutes.

- Minimize line usage

  Obtaining files locally prevents an increase in network traffic during the startup process.

When you choose the Local Boot option for routine startups, the BayStack router reads the IP addresses from the local configuration file and assigns them to the appropriate interfaces.

Steps for Completing Startup Options

This section summarizes the steps for completing these startup options:

- EZ-Install
- Netboot
- Directed Netboot
- Local Boot

You can use Netboot for some procedures and Local Boot for others, provided you have set up the network to support Netboot.

Note: To boot the BayStack router over the network, all routers in the path to the BootP server must be running BayRS Version 7.60 or later.

EZ-Install

Complete the following steps for the EZ-Install option:

1. Use the Configuration Manager in local mode to create a complete configuration file for the BayStack router. (See Chapter 3 and *Configuring and Managing Routers with Site Manager.*)
2. Set up a UNIX workstation on the network to support BootP. (See Chapter 2.)
3. Create a BootP client on the upstream router to support automated addressing, and configure all routers between the BootP server and the BayStack router as BootP relay agents. (See Chapter 3.)
4. Ensure that there is a network connection from a synchronous interface on the BayStack router to the upstream router.

Note: If the BayStack router will connect to the upstream router over a Frame Relay circuit, ensure that the upstream router is running BayRS Version 7.80 or later.

5. A person at the BayStack router site installs and turns on the router. (See the model-specific hardware installation guide.)

   The BayStack router obtains a software image from its local file system, an IP address from the upstream router, and the customized configuration file from the BootP server. ("The Boot Process" on page 1-5 describes this process; no action is required.)

   If the configuration file meets your network requirements, the BayStack router starts bridging and routing traffic.

6. Use the Site Manager Statistics Manager and Events Manager tools to verify that the BayStack router is routing traffic as specified in the configuration file. (See *Configuring and Managing Routers with Site Manager.*)

Netboot

Complete the following steps for the Netboot option:

1. Use the Configuration Manager in local mode to create a complete configuration file for the BayStack router. (See Chapter 3 and *Configuring and Managing Routers with Site Manager.*)
2. Set up a UNIX workstation on the network to support BootP. (See Chapter 2.)
3. Use Site Manager to enable BootP on each router interface between the BayStack router and the BootP server. (See Chapter 3.)
4. Ensure that there is a network connection from a synchronous, Ethernet, or token ring (ARN only) interface on the BayStack router to the upstream router.

Note: If the BayStack router will connect to the upstream router over a Frame Relay circuit, ensure that the upstream router is running BayRS Version 7.71 or later.

5. Install the kernel and application files in the BootP server's file system, and make sure that they reside in the same directory. (See Chapter 2.)
6. The person at the BayStack router site establishes a Technician Interface session, or you establish a session using a modem. (See the hardware installation guide.)
7. The person at the BayStack router console uses the **bconfig** and **ifconfig** commands to configure a synchronous, Ethernet, or token ring (ARN only) interface. (See Chapter 4 and the hardware installation guide.)
8. The person at the BayStack router site boots the router. (See the hardware installation guide.)

   After the BayStack router boots, it obtains at least one startup file from the BootP server. If the configuration file meets your network requirements, the BayStack router starts bridging and routing traffic.
9. Use the Site Manager Statistics Manager and Events Manager tools to verify that the BayStack router is routing traffic as specified in the configuration file. (See *Configuring and Managing Routers with Site Manager.*)

Directed Netboot

Complete the following steps for the Directed Netboot option:

1. Use the Configuration Manager in local mode to create a complete configuration file for the BayStack router. (See Chapter 3 and *Configuring and Managing Routers with Site Manager.*)
2. Set up a network server to support TFTP. (See Chapter 2.)
3. Install the BayStack router image and/or configuration files in the TFTP server's file system. (See Chapter 2.)
4. Ensure that there is a network connection from a synchronous, Ethernet, or token ring (ARN only) interface on the BayStack router to the upstream router.

Note: If the BayStack router will connect to the upstream router over a Frame Relay circuit, ensure that the upstream router is running BayRS Version 8.00 or later.

5. The person at the BayStack router site establishes a Technician Interface session, or you establish a session using a modem. (See the hardware installation guide.)
6. The person at the BayStack router console uses the **bconfig** and **ifconfig** commands to configure a synchronous, Ethernet, or token ring (ARN only) interface. (See Chapter 4 and the hardware installation guide.)
7. The person at the BayStack router site boots the router. (See the hardware installation guide.)

   The BayStack router obtains one or more startup files from the TFTP server. If the configuration file meets your network requirements, the BayStack router starts bridging and routing traffic.
8. Use the Site Manager Statistics Manager and Events Manager tools to verify that the BayStack router is routing traffic as specified in the configuration file. (See *Configuring and Managing Routers with Site Manager.*)

Local Boot

Complete the following steps for the Local Boot option:

1. Complete the Quick-Start configuration worksheets. (See Appendix C.)
2. The person at the BayStack router site establishes a Technician Interface session, or you establish a session using a modem. (See the hardware installation guide.)

   If you are not at the BayStack router console, provide the person at the console with the information in the configuration worksheets. The hardware installation guide contains duplicate worksheets. (See Appendix C.)
3. The person at the BayStack router console runs the installation script (*install.bat* for the AN/ANH and *inst_arn.bat* for the ARN), using the information provided in the worksheets you completed in step 1. (See Appendix C and your hardware installation guide.)
4. The installation script records the responses in a configuration file. (See Appendix C and your hardware installation guide.)

   If the configuration file meets your network requirements, the BayStack router starts bridging and routing traffic.
5. Use the Site Manager Statistics Manager and Events Manager tools to verify that the BayStack router is routing traffic as specified in the configuration file. (See *Configuring and Managing Routers with Site Manager.*)

Chapter 2
Setting Up a UNIX Boot Server

To support network booting, you need to set up a UNIX workstation on the network to run BootP and TFTP. This chapter describes what you need to do at a UNIX workstation to prepare for booting BayStack routers over the network.

Topic	Page
Setting Up a BootP Server	2-2
Setting Up a TFTP Server	2-8
What to Do Next	2-12

When a BayStack router boots over the network, it obtains one or more of its startup files from a UNIX server. When the BayStack router uses EZ-Install or Netboot, the server supplies startup file path names using BootP. The router then retrieves the files using TFTP. When the BayStack router uses Directed Netboot, it already knows the path names of the files it needs and retrieves the files directly from the server using TFTP.

Complete the appropriate sections of this chapter for the startup option you are configuring:

To Configure This Startup Option	Complete These Sections
EZ-Install	• Setting Up a BootP Server • Setting Up a TFTP Server
Netboot	• Setting Up a BootP Server • Setting Up a TFTP Server
Directed Netboot	• Setting Up a TFTP Server

Setting Up a BootP Server

To support EZ-Install or Netboot, the BayStack router needs a network connection to a BootP server. You configure a UNIX workstation as a BootP server by:

- Setting up BootP sockets
- Configuring the BootP Daemon (BootPD)

Setting Up BootP Sockets

A *socket* is a UNIX mechanism for creating virtual connections between operating-system and network processes. For each socket, the */etc/services* file must include a User Datagram Protocol (UDP) descriptor that provides process-to-process addressing information.

To set up the send and receive sockets for BootP:

1. **Log in to the UNIX workstation as *root*.**
2. **Use a text editor to insert the following two lines in the */etc/services* file:**

```
bootps          67/udp          # bootp server
bootpc          68/udp          # bootp client
```

Configuring BootPD

A *daemon* is an unattended process (that is, one that runs in the background). An application typically calls a daemon to perform a standard routine or service (in this case, BootP).

Complete the following tasks to configure BootPD on a UNIX workstation:

- On Sun workstations, copy the BootPD program to the */etc* directory.
- Set up BootPD to run.
- Set up BootPD to respond to BayStack routers.

Copying BootPD on Sun Workstations

Depending on the operating system you use, Bay Networks may or may not ship BootPD with the Site Manager package.

The AIX and HP-UX operating systems include BootPD. SunOS and Solaris do not include BootPD, so Site Manager automatically installs BootPD on Sun workstations running these operating systems.

Copy the *bootpd* file to the */etc* directory as follows:

1. **Log in to the UNIX workstation as *root*.**
2. **Enter the following command:**

   cp /usr/wf/bin/bootpd /etc

Setting Up BootPD to Run

To configure your workstation to run BootPD when it receives a BootP request packet:

1. **As *root*, use a text editor to open the */etc/inetd.conf* file.**
2. **Make sure that no other line in the file begins with "bootps."**

   If there is such a line, your workstation is already configured as a BootP server. Comment out this line by typing a pound sign (#) at the beginning of the line so that the server will use the BootPD program that you specify in the next step.
3. **Insert the following line anywhere in the file to configure your workstation as a BootP server:**

   ```
   bootps dgram udp wait root /etc/bootpd bootpd
   ```
4. **Save and exit the file.**

Setting Up BootPD to Respond to BayStack Routers

When the operating system receives a BootP request packet, it starts BootPD. BootPD matches the source IP address of the packet to an IP address in its BootP table (*bootptab* file) to determine the path names of the requested startup files.

Note: The *bootptab* file can include the same path name for all booting routers, or a different path name for each IP address.

Entries in *bootptab* also include optional parameter tags. Bay Networks supplies a sample *bootptab* file that Site Manager installs automatically in the */usr/wf/config* directory. Use a copy of this sample file if you do not already have a *bootptab* file.

To set up BootPD to respond to booting routers:

1. **As *root*, view the contents of the */etc* directory to determine if it already contains a *bootptab* file.**

   If it does contain a *bootptab* file, skip steps 2 and 3 and proceed to step 4 to edit this file.

2. **Enter the following command to copy the *bootptab* file to the */etc* directory:**

   cp /usr/wf/config/bootptab /etc

3. **Use a text editor to open the *bootptab* file in the */etc* directory.**

4. **In the *bootptab* file, type the information that pertains to the BayStack routers in your network.**

   The section that follows explains how to format your entries. Use Tables 2-1 and 2-2 to determine which tags and values you need. Figure 2-1 shows the sample *bootptab* file included with the Site Manager software. The comments in this file explain the sample definitions.

5. **Save the *bootptab* file changes.**

Note: The *bootptab* file must reside in the */etc* directory. BootPD fails if it cannot find the *bootptab* file in */etc*.

Editing the bootptab File

Specify a <*hostname*> definition in the *bootptab* file for each BayStack router in your network. The format of each definition in the *bootptab* file is as follows:

<*hostname*>:\
:<tg>=<value>:\
:<tg>=<value>:\
:<tg>=<value>:

- <*hostname*> is a name you assign to a BootP client (each BayStack router is a client). Each <*hostname*> definition must:
  - -- Contain a maximum of 79 characters
  - -- Contain alphanumeric characters, and an alphabetic first character
  - -- Not contain an underscore (_)

- You can use a dot (.) to separate characters, but the character immediately following the dot must be alphabetic.
- <*tg*> is a BootP parameter name (tag).
- Follow each tag with an equals sign (=) and a value.
- A pound sign (#) at the beginning of a line indicates a comment.
- A backslash (\) at the end of a line indicates continuation of the line.

Note: Make sure you type a backslash (\), not a slash (/), at the end of each line that does not conclude a definition.

Table 2-1 lists the BootPD tags for router host names. Table 2-2 lists the BootPD tags for kernel file names.

Table 2-1. BootPD Tags for a Router Host Name

Tag	Required or Optional	Value	Example
ip	Required	IP address -- the host IP address of the router	ip=192.32.5.2
sm	Optional	Subnet mask -- the host subnet mask of the router	sm=255.255.255.0
T129	Required	Path name of the router configuration file. The maximum length is 49 characters.	T129="/usr/cfg/an_Bost.cfg"
T130	Required	Size of the router configuration file in 512-byte blocks. This tag determines how much memory the router allocates for the file. Set this tag to 0x0004.	T130=0x0004
tc	Optional	Table continuation -- a pointer to another location in the same file for additional information. This tag points to information that is common to all routers that use BootPD. If the information contradicts information in a specific host-name definition, BootPD uses the information in that definition.	tc=general

Table 2-2. BootPD Tags for a Kernel File Name

Tag	Required or Optional	Value	Example
hd	Required	Home directory -- the directory on the workstation containing the kernel files. By default, the Image Builder writes its files to the directory specified in the example. The *rel< number >* directory contains the current BayRS release. If you change the default or move the files to another directory, specify that directory.	hd=/$HOME/.builder_dir/rel120/an
bf	Required	Boot file -- the name of the kernel file.	bf=krnl_an.exe
bs	Required	Boot size -- the size of the kernel file in 512-byte blocks. If you specify **auto** as the size, the BootP server calculates the size of the file for each BootP request.	bs=auto
vm	Required	Vendor magic cookie selector -- the BootP server should always reply in a manner compliant with RFC 1048. You must specify **rfc1048** for this tag in order for the BayStack router to understand the BootP responses it receives.	vm=rfc1048

The sample *bootptab* file shown in Figure 2-1 enables two ANs (named AN.Boston and AN.Chicago) to boot over the network. Use the basic format shown in Figure 2-1 to set up your own *bootptab* file.

Verifying Consistent BootP Service

You may want to configure a second workstation as a BootP server for backup purposes. If you do so, make sure that the two *bootptab* files are identical. Also, make sure that the kernel, application, and string files are from the same BayRS version.

```
# This file contains the default specification for the boot
# image file to be used by all ANs.

# "general" contains information that is common to all ANs
# that need to boot via BOOTP. You can use any word in place
# of "general."
    general:\

# "hd" specifies that /$HOME/.builder_dir/rel900/an is the
# directory on the workstation where the boot files are
# located. By default, the Image Builder writes its files to
# this directory. If you are using a router software version
# later than 8.00, add the associated three digits to the end
# of the "rel" directory name. If you moved the files to
# another directory, specify that directory.
    :hd=/$HOME/.builder_dir/rel812/an:\

# "bf" specifies that the name of the boot image kernel file
# is krnl_an.exe.
    :bf=krnl_an.exe:\

# "bs" indicates the size of the boot file. If you specify
# "auto" as the size, the BOOTP server calculates the size of
# the file for each BOOTP request.
    :bs=auto:\

# "vm" indicates that the BOOTP server should always reply in
# a manner compliant with RFC 1048. You must enter rfc1048
# for this tag so that the AN can understand the BOOTP
# responses it receives.
    :vm=rfc1048:

# This line marks the beginning of the active definition for
# the AN we are naming "AN.Boston."
    AN.Boston:\

# "ip" indicates the IP address of the AN.
    :ip=192.32.5.2:\

# "T130" indicates the size of the AN's configuration file in
# 512-byte blocks. Always use 0x0004.
    :T130=0x0004:\
# "T129" indicates the pathname of the configuration file
# for the AN.
    :T129="/usr1/cfg/AN_Bost.cfg":\

# "tc" indicates that the "general" definition contains more
# information that applies to BOOTP transmissions to
# "AN.Boston."
    :tc=general:

# This is the active definition for the AN we are naming
# "AN.Chicago."
    AN.Chicago:\
    :ip=10.0.0.4:\
    :T130=0x0004:\
    :T129="/rte3/cfg/AN_Chic.cfg":\
    :tc=general:
```

Figure 2-1. Sample bootptab File

Setting Up a TFTP Server

The BayStack router needs a network connection to a TFTP server to complete EZ-Install, Netboot, or Directed Netboot. You configure a UNIX workstation as a TFTP server by:

- Setting up the TFTP Daemon (TFTPD) to provide TFTP access
- Setting up static routes to BayStack routers (optional)
- Loading the changes into memory

Setting Up TFTPD

When you set up the TFTPD server on a UNIX workstation, you can allow TFTP access to the root directory and any subdirectory, or restrict TFTP access to a specified directory or path name.

Allowing TFTP access to all directories is the simpler procedure. Specifying a directory provides security, but requires either keeping the startup files in the specified directory or creating a link to each path name.

Providing TFTP Access to All Directories

To provide TFTP access to files in the *root* (/) directory and all subdirectories, insert the appropriate line for your operating system in the */etc/inetd.conf* file. Find the sample line for your operating system in Table 2-3.

Table 2-3. Providing TFTP Access to All Directories

Operating System	Sample Line to Insert in /etc/inetd.conf File
SunOS	`tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s /`
Solaris	`tftp dgram udp wait root /usr/sbin/in.tftpd in.tftpd -s /`
HP-UX	`tftp dgram udp wait root /etc/tftp tftp`
AIX	Use the System Management Interface Tool (SMIT) to configure TFTP. For instructions, see the IBM guides on TCP/IP daemons and TFTP.

Restricting TFTP Access to Specified Directories

To restrict TFTP access to a specific directory:

1. **Log in to your UNIX workstation as** *root***.**
2. **Insert the appropriate line in the** */etc/inetd.conf* **file.**

   The examples in Table 2-4 restrict access to the */tftpboot* directory. You can substitute any directory you want.

Table 2-4. Restricting TFTP Access to Specified Directories

Operating System	Sample Line to Insert in /etc/inetd.conf File
SunOS	`tftp dgram udp wait root /usr/etc/in.tftpd in.tftpd -s /tftpboot`
Solaris	`tftp dgram udp wait root /usr/sbin/in.tftpd in.tftpd -s /tftpboot`
HP-UX	`tftp dgram udp wait root /etc/tftp tftp -s /tftpboot`
AIX	Use the System Management Interface Tool (SMIT) to configure TFTP. For instructions, see the IBM guides on TCP/IP daemons and TFTP.

3. **Create a symbolic link in the specified directory for every startup file path name.**

   For example, to set up symbolic links in the */tftpboot* directory:

   a. **Enter the following command to move to the** */tftpboot* **directory:**

      cd tftpboot

Note: Do not insert a slash (/) in the **cd tftpboot** command. A symbolic link cannot contain references to directories above the directory specified in the **tftpd** command line.

   b. **Enter the following commands to create symbolic links:**

      ln -s . usr
      ln -s . tftpboot

Adding a TFTP User for an HP 9000 Workstation

Follow the instructions in this section only if you are running Site Manager on an HP 9000 workstation.

To add a TFTP user for the HP 9000, insert the following line in your */etc/passwd* file. Bay Networks recommends that you use *root* (/) as the TFTP home directory.

tftp::*<user_id>***:***<group_no.>***::/:/bin/false**

For example:

```
tftp::510:20::/:/bin/false
```

Note: Bay Networks recommends that you *not* use the System Administration Manager (SAM) utility to add a TFTP user.

Setting Up Static Routes to Next-Hop Routers

If your workstation requires static routes, read this section to learn how to specify a path to the network by:

- Editing the */etc/inetd.conf* file
- Verifying the routes
- Loading the changes into memory

You must set up a static route for each path between the BayStack routers and the BootP server's next-hop router.

Note: You may want to specify a static route in a multihop environment or in an environment using routing protocols such as RIP, where minor routing update delays may extend the time it takes to Netboot.

Editing the /etc/inetd.conf File

Insert the following line in the */etc/inetd.conf* file to set up a static route:

route add *<destination> <gateway> <hops>*

<destination> is the IP address of the BayStack router or its network.

<*gateway*> is the IP address of the network destination to which packets will be addressed.

<*hops*> is the number of hops to the network destination.

Verifying the Routes

After adding a static route for each path to the BayStack routers, enter the following command to display the routing table and verify the routes you added:

netstat -r

Loading the Changes into Memory

Once you modify the */etc/inetd.conf* file, you must force the operating system to reread it by rebooting the workstation or by issuing a hang-up signal.

In most cases, reboot the workstation. Issue a hang-up signal if the workstation is performing a task that you do not want to interrupt.

Rebooting Your Workstation

To reboot your workstation:

1. **Log in as** *root***.**
2. **Enter the following command:**

   /etc/shutdown now -r

   The **-r** flag reboots the workstation.

Issuing a Hang-Up Signal

To issue a hang-up signal:

1. **Log in as** *root***.**
2. **Enter the following command to hang up on the** *inetd* **process:**

   ps -aux | grep inetd

   The system displays a line similar to this one:

   ```
   root   148  0.0  0.0   48    0 ?  IW Sept 14  0:07 inetd
   ```

3. **Enter the following command, using the first number in the line after the word "root" (in this case, 148):**

   ```
   kill  -1  148
   ```

The *inetd* process rereads the */etc/inetd.conf* file.

What to Do Next

Before you can netboot the BayStack router, complete the steps in Chapter 3.

Chapter 3
Configuring Netboot Services with Site Manager

This chapter describes how to use Site Manager to configure netboot services for BayStack routers in the network.

Topic	Page
Preparing Configuration and Image Files	3-2
Enabling Netboot or Directed Netboot	3-6
Adding a Netboot or Directed Netboot Interface	3-8
Configuring a Netboot or Directed Netboot Interface	3-9
Setting Up Routing Paths for Netboot	3-10
Creating the BootP Client Interface Table	3-13

Complete the appropriate sections of this chapter for the startup option you are configuring:

To Configure This Startup Option	Complete These Sections
EZ-Install (default)	• Preparing Configuration and Image Files
EZ-Install over Frame Relay PVC in group-access mode	• Preparing Configuration and Image Files • Creating the BootP Client Interface Table
Netboot	• Enabling Netboot or Directed Netboot • Adding a Netboot or Directed Netboot Interface • Configuring a Netboot or Directed Netboot Interface • Setting Up Routing Paths for Netboot
Directed Netboot	• Enabling Netboot or Directed Netboot • Adding a Netboot or Directed Netboot Interface • Configuring a Netboot or Directed Netboot Interface

Preparing Configuration and Image Files

The BayStack router ships with a flash memory card that contains a default (generic) configuration file and the *an.exe* or *arn.exe* router software image. For the BayStack routers in your network, you must create:

- A unique configuration file for each netbooting router
- A uniform software image for all netbooting routers

Creating Configuration Files

To prepare network configuration files:

1. **Use the Configuration Manager in local mode to create a configuration file for each BayStack router.**

   For instructions, see *Configuring and Managing Routers with Site Manager.* Also, see the following:

   - Table 3-1 for the Site Manager module name to use when creating a configuration file for BayStack AN routers
   - Tables 3-2 through 3-4 for the module names to use when creating a configuration file for BayStack ARN routers.

Note: For ARN routers, you choose base, expansion, and adapter modules separately.

Site Manager identifies AN and ANH routers with module names that use mnemonic abbreviations for each of the router's connectors. For example, the module name E/T/2S identifies an AN with one Ethernet, one token ring, and two serial interfaces. The module name 8ptEHub/3S/N11 DCM identifies an 8-port ANH with a third serial interface and an RMON data collection module (DCM) installed.

Table 3-1 lists the mnemonics used in AN and ANH module names..

Table 3-1. Configuration Manager Module Names for AN and ANH

Module Name Mnemonic	Connector Type
E	Ethernet
T	Token ring
2S	Two serial
3S	Three serial
BRI-S	ISDN BRI with S/T interface
BRI-U	ISDN BRI with U interface
BRI-S+	ISDN BRI S/T interface, floating B-channel
BRI-U	ISDN BRI U interface, floating B-channel
N11 DCM	RMON data collection module
CSU_DSU	56/64K DSU/CSU
FT1	T1/Fractional T1
FE1	E1/Fractional E1
8pt EHub	8-port Ethernet hub
12pt EHub	12-port Ethernet hub

For ARN routers, you choose base, expansion, and adapter modules separately. Table 3-2 lists the *base module* (system board) options for ARN routers. An ARN can have only one base module.

Table 3-2. BayStack ARN Base Module Configurations

Base Module	Site Manager Module Name
Ethernet	Ethernet
Ethernet with DCM	Ethernet/DCM
Token Ring	Token Ring
100 Base-T Ethernet	10/100BASE-TX Ethernet
100 Base-FX Ethernet (fiber)	100BASE-FX Ethernet

Table 3-3 lists the optional *expansion modules* available for an ARN. An expansion module is a parallel daughterboard installed on the base module. The ARN base module supports only one expansion module.

Table 3-3. BayStack ARN Expansion Module Configurations

Expansion Module	Site Manager Module Name
Ethernet	Ethernet
Ethernet with DCM	Ethernet/DCM
Token Ring	Token Ring
Tri-Serial	TRI Serial
Ethernet/Tri-Serial	Ethernet/TRI Serial
Ethernet/Tri-Serial with DCM	Ethernet/TRI Serial/DCM
Token Ring/Tri-Serial	Token Ring/TRI Serial

Table 3-4 lists the optional *adapter modules* for an ARN. An adapter module is a serial daughterboard installed in the front-panel card cage. The ARN base module supports one or two adapter modules.

Table 3-4. BayStack ARN Adapter Module Configurations

Adapter Module	Site Manager Module Name
Serial	Serial
ISDN BRI S/T	ISDN ‘S/T’
ISDN BRI U	ISDN ‘U’
56/64K DSU/CSU*	56/64K DSU/CSU
V.34 Modem	V34 Modem
X.25 PAD	X25 PAD
FT1/T1 DSU/CSU	Fractional T1
FE1/E1 G703	Fractional E1

* The ARN supports network booting over DSU/CSU interfaces only for the default configuration, 56 Kb/s DDS lines. You cannot netboot over a 64 Kb/s DSU/CSU interface.

2. **Record the name of each configuration file and corresponding BayStack router for later reference when configuring network boot options.**

   When you name configuration files, keep the following restrictions in mind:

   - Bay Networks recommends that the operational configuration file for each router be named *config*. If a router experiences a power failure, it boots from the file named *config* when power returns. However, the configuration files that you save on a BootP server for Directed Netboot do *not* have to be named *config* because you specify the configuration file path name (see the description of the Site Manager parameter Boot Config Pathname on page A-3.)
   - Configuration file names must begin with an alphabetic character. The remaining characters must be alphanumeric and can include an underscore (_). You cannot use spaces.
   - Configuration file names can consist of 1 to 15 characters, including a dot (.). Bay Networks recommends that you limit file names to 8 characters to ensure that all supported operating systems can recognize the names.
   - Configuration file-name extensions are optional and must follow a file name and a dot. Bay Networks recommends that you limit file-name extensions to three characters.
   - BootP allows a maximum of 49 characters in a path name, including slashes, file name, optional dot, and file-name extension.

3. **If the BootP server and Site Manager do not reside on the same workstation, transfer the configuration files to the BootP server.**

Preparing an Image

If you want the router to automatically boot a network-based image when starting up (using Netboot or Directed Netboot), use the Site Manager Image Builder tool.

To create the kernel, application, and string files for storage on the BootP/TFTP server:

1. **On the Site Manager workstation, open the software image file using the Image Builder tool.**

   For instructions on how to use the Image Builder, see *Configuring and Managing Routers with Site Manager.*

After you open the image file, the Image Builder automatically extracts the kernel image file, application files, and string files.

Keep the following in mind:

- Be sure to choose the correct image (*an.exe* for an AN/ANH, or *arn.exe* for an ARN). If you choose an image for another router type, you cannot generate the correct files.
- The kernel file and all of the application (*.exe*) files and string (*.str*) files must be from the same software image file. If these files are from different software versions, the router may fail to boot or may not operate properly.

2. **If you use a different workstation as a BootP server, transfer to that workstation all of the files in the directory that contains the kernel file.**

   The router cannot netboot until the kernel file is available on the BootP server.

Enabling Netboot or Directed Netboot

By default, the router obtains the software image files from its local file system and its configuration file from a BootP server. You can use Site Manager to display and change these settings as follows:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Net Boot**.	The Net Boot menu opens.
4. Choose **Global**.	The Edit Netboot Global Parameters window opens.

Site Manager Procedure *(continued)*	
You do this	**System responds**
5. Set the following parameters: • **Boot Image From Network** • **Boot Config From Network** • **Boot Server Address** • **Boot Image Pathname*** • **Boot Config Pathname** Click on **Help** or refer to the parameter descriptions beginning on page A-2.	Site Manager enables Netboot if you enable one or both of the first two parameters. Site Manager enables Directed Netboot if you enable one or both of the first two parameters, and then specify values for the remaining parameters.
6. Click on **OK**.	You return to the Configuration Manager window.

* When you netboot a BayStack router, the value of Boot Image Pathname is the full path name of the active image on the remote server. When you boot a BayStack router locally, the name of the active image (wfHwEntry.wfHwActiveImageName) appears in the form <*volume*>:<*image name*>.

Note: Instead of enabling the Boot Image From Network parameter, you can use the Router Files Manager tool to transfer an upgraded image file to the BayStack router. To do this, delete the old image file, compact the file system, and copy the upgraded image file to the BayStack router. To verify that the file transfer was successful, use the Router Files Manager to confirm that the new image file on the BayStack router is the same size as that on the Site Manager workstation. For more information about the Router Files Manager, see *Configuring and Managing Routers with Site Manager.*

You can also use Technician Interface commands to configure network booting, as described in Chapter 4.

Note: Before the router can obtain files over the network, you must set up a UNIX BootP server on the network, as described in Chapter 2.

Adding a Netboot or Directed Netboot Interface

When you enable Netboot or Directed Netboot, you must add (and configure) at least one BayStack router circuit as a Netboot interface. If you are using EZ-Install, you do not need to configure Netboot interfaces. You can use Site Manager to add a Netboot interface.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Net Boot**.	The Net Boot menu opens.
4. Choose **Interfaces**.	The Netboot Interfaces window opens.
5. Click on **Add**.	The Netboot Interface window opens.
6. Set the **Connector** parameter. Site Manager: Connector parameter: page A-4	
7. Click on **OK**.	You return to the Netboot Interfaces window, which shows the interface you just added.

Configuring a Netboot or Directed Netboot Interface

You can use Site Manager to configure a Netboot or Directed Netboot interface.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Net Boot**.	The Net Boot menu opens.
4. Choose **Interfaces**.	The Netboot Interfaces window opens.
5. In the scroll box, choose the interface you want to configure.	The window shows the parameter values for that interface.
6. Set the following parameters: • **Connector IP Address** • **Connector Subnet Mask** • **Connector Next Hop** • **Connector Protocol Mask** • **Connector State** Click on **Help** or refer to the parameter descriptions beginning on page A-4.	
7. Click on **Apply**, then click on **Done**.	You return to the Configuration Manager window.

Note: If you configure more than one interface to Netboot, the first interface to receive a reply from the BootP server will complete the Netboot process.

Setting Up Routing Paths for Netboot

You set up the routing paths between the BootP server and the BayStack routers by:

- Enabling each router interface in the paths to the BayStack routers
- Creating a BootP relay agent forwarding table for each router in a path
- Creating a BootP client interface table for the upstream router when the BayStack router is on a Frame Relay PVC in group access mode

Enabling Router Interfaces

You must enable BootP relay (also called BootP pass-through or gateway) on all interfaces in the paths between BayStack routers and the BootP server. For example, you would enable BootP relay on the interfaces indicated in Figure 3-1.

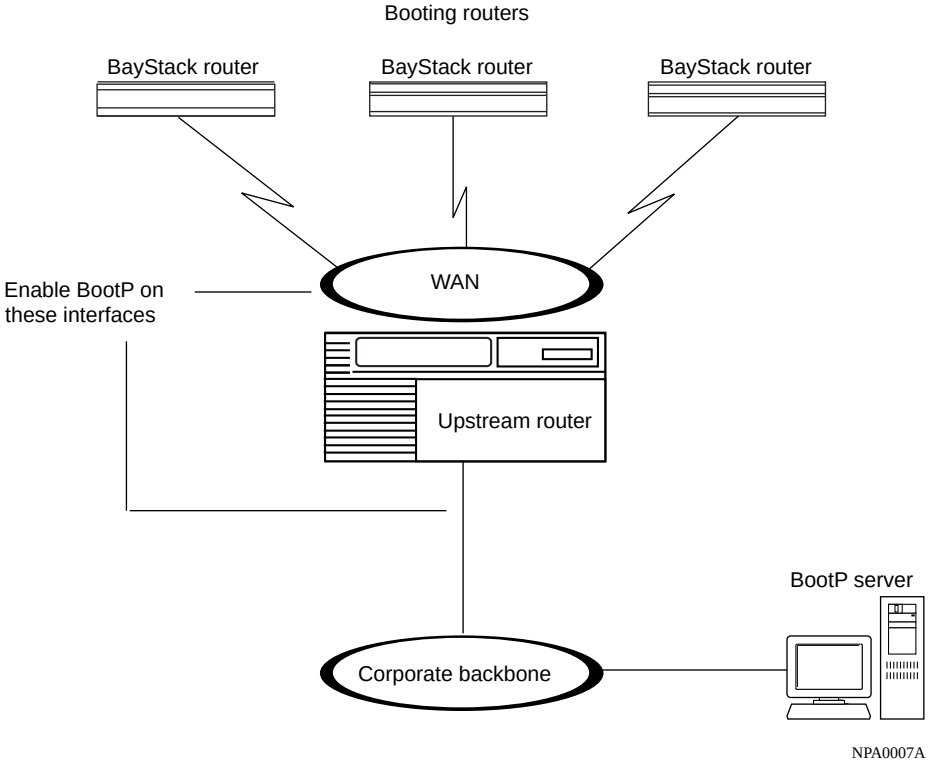

Figure 3-1. Enabling BootP Relay in a Sample Network

You can use Site Manager to enable BootP relay on an interface.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the connector on which you want to enable BootP relay.	The Edit Connector window opens.
2. Choose **Edit Circuit**.	The Circuit Definition window opens.
3. Choose **Protocols**.	The Protocols menu opens.
4. Choose **Add**.	The Select Protocols window opens.
5. Choose **BOOTP**.	The BOOTP menu opens.
6. Choose **File**.	The File menu opens.
7. Choose **Exit**.	You return to the Configuration Manager window.

Creating BootP Relay Agent Forwarding Tables

You must create a BootP relay agent forwarding table for every router that passes BootP traffic between the BayStack router and the BootP server.

The BootP relay agent forwarding table allows you to specify the IP interface that receives the incoming BootP request packets, and the associated IP interface that forwards them. You can add multiple pairs of incoming and outgoing interfaces to support connections to multiple routers in your network.

You can use Site Manager to create the BootP relay agent forwarding table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **BOOTP**.	The BOOTP menu opens.
4. Choose **Relay Agent Interface Table**.	The BOOTP Relay Agent Interface Table window opens.*
5. Click on **Forward I/F** (interface).	The BOOTP Relay Agent Forwarding Table window opens.
6. Click on **Add**.	The BOOTP Addresses window opens.
7. Set the following parameters: • **Input IP Address** • **Output IP Address** Click on **Help** or refer to the parameter descriptions beginning on page A-7.	
8. Click on **OK**.	The BOOTP Relay Agent Forwarding Table window lists the connector and input IP address on the left, and the connector and output IP address on the right. If you specify an IP address of an interface that is not configured, `???` appears instead of the connector (for example, `??? 192.32.23.3`). If you configure the IP address, Site Manager displays the appropriate connector.
9. Click on **Done**.	You return to the BOOTP Relay Agent Interface Table window.

* Click on **Help** or see *Configuring SNMP, BootP, DHCP, and RARP Services* for a description of the parameters in the BOOTP Relay Agent Interface Table window. Make sure that the Timeout Secs. parameter is set to the default, 0.

Creating the BootP Client Interface Table

The upstream router is the booting router's next-hop router. By default, the booting router's synchronous interfaces automatically try to obtain IP addresses from the upstream router. This is the EZ-Install process.

If the BayStack router using EZ-Install obtains its address from the upstream router, and the upstream router's interface to the BayStack router is a Frame Relay PVC in group access mode, you must use Site Manager to connect to the upstream router and create a BootP client interface table (in addition to a BootP relay agent forwarding table).

Note: You do not need to create a BootP client interface table if the Frame Relay PVC is configured to operate in direct access mode, or if the circuit is configured to operate with Bay Networks Standard PPP (HDLC encapsulation).

The BootP client interface table allows you to specify and pair the IP address of the BayStack router with the DLCI of the Frame Relay group access PVC.

Note: If you are using EZ-Install over Frame Relay, you can have up to 20 PVCs for a single Frame Relay interface on the upstream router. If you have more than 20 PVCs on the Frame Relay interface, the EZ-Install process may fail. To ensure that the process does not fail, configure a maximum of 20 PVCs for a Frame Relay interface.

For more information about the DLCI and Frame Relay, see *Configuring Frame Relay Services.*

You can use Site Manager to create the BootP client interface table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **BOOTP**.	The BOOTP menu opens.
4. Choose **Relay Agent Interface Table**.	The BOOTP Relay Agent Interface Table window opens.*
5. Click on **Client I/F** (interface).	The BOOTP Client Interface Table window opens.
6. Click on **Add**.	The BOOTP Client Interface Address window opens.
7. Set the following parameters: • **IP Address** • **DLCI Number** Click on **Help** or refer to the parameter descriptions beginning on page A-8.	
8. Click on **OK**.	The BOOTP Client Interface Table window lists the client IP interface and the DLCI number you added.
9. Click on **Done**.	You return to the BOOTP Relay Agent Interface Table window.

* Click on **Help** or see *Configuring SNMP, BootP, DHCP, and RARP Services* for a description of the parameters in the BOOTP Relay Agent Interface Table window. Make sure that the Timeout Secs. parameter is set to the default, 0.

Chapter 4
Configuring Netboot Client Services

This chapter describes how to enable a BayStack router for netboot startup options using commands at the Technician Interface or AN Monitor prompt.

Topic	Page
Using Netboot Configuration Commands	4-2
Setting the Boot Configuration	4-3
Setting the Netboot Interface Configuration	4-5
Verifying Your Configuration	4-10
What to Do Next	4-11

First, read "Using Netboot Configuration Commands" on page 4-2 for information about working with someone at a remote BayStack router site or accessing a BayStack router command line. Then, complete the appropriate sections of this chapter for the BayStack router's startup configuration:

For This Startup Configuration	Complete These Sections
Netboot or Directed Netboot over a serial interface	• Setting the Boot Configuration • Configuring a Serial Interface for Network Booting
Netboot or Directed Netboot over an Ethernet interface	• Setting the Boot Configuration • Configuring an Ethernet Interface for Network Booting
Netboot or Directed Netboot of an ARN over a token ring interface	• Setting the Boot Configuration • Configuring an ARN Token Ring Interface for Network Booting

Using Netboot Configuration Commands

This chapter provides instructions for using the **ifconfig**, **bconfig**, and **getcfg** commands to configure Netboot and Directed Netboot.

If you are not configuring the BayStack router yourself, you can determine the appropriate syntax for these commands and provide the person at the router site with the exact command lines to use.

To access a BayStack router command line, you need a management console connection to the router. With a terminal or modem console connection, you can view router diagnostic messages and use the **ifconfig** and **bconfig** commands to configure Netboot and Directed Netboot. You use **getcfg** to verify a configuration.

To display a command-line login prompt, you can do one of the following:

- Wait for the BayStack router to local-boot (that is, wait for EZ-Install to fail).
- Interrupt the startup process by issuing a break sequence. This automatically starts the AN Monitor, a firmware diagnostics monitor for BayStack routers.

Note: Be sure to issue the break sequence before EZ-Install completes.

The break sequence depends on the management console you are using. Some terminals have specific break keys; others require a specific key sequence to issue a break (for example, [Control]-c or ~ #). See the documentation for your terminal or PC terminal emulator for the correct break sequence.

To log in to either the AN Monitor or the Technician Interface, enter **Manager** at the login prompt.

Note: Manager is case-sensitive; use an uppercase M.

The Technician Interface or AN Monitor command-line prompt appears. Proceed to the appropriate section:

- Setting the Boot Configuration
- Setting the Netboot Interface Configuration

Setting the Boot Configuration

This section describes how to use the **bconfig** command to configure a netboot option at the Technician Interface or AN Monitor command-line prompt.

- For Netboot, you use **bconfig** to specify the network location of a configuration file or boot image (software image or kernel file) for the BayStack router to use at startup.
- For Directed Netboot, you use **bconfig** to specify the IP address of the TFTP server and the full path name of the boot image and configuration files.

Using the bconfig Command Format

To configure an interface for Netboot, use the following **bconfig** command format:

bconfig -d [**image** | **config**]

To configure an interface for Directed Netboot, use the following **bconfig** command format:

bconfig [**image** | **config**] [**local** | **network** [*<TFTP host> <TFTP pathname>*]]

You must issue the **bconfig** command twice: once to specify the location of the boot image, and again to specify the location of the configuration file.

See Table 4-1 for a description of the **bconfig** command options.

Table 4-1. bconfig Command Options

Option	Description
image	Specifies the BayStack router's boot image. The boot image can be the complete software image file (*an.exe* or *arn.exe*) or the kernel file (*krnl_an.exe* or *krnl_arn.exe*)
config	Specifies the BayStack router's configuration file
local	Indicates that the specified file (<*image*> or <*config*>) resides in the BayStack router's local file system
network	Indicates that the specified file (<*image*> or <*config*>) resides on a remote file system

(continued)

Table 4-1. bconfig Command Options *(continued)*

Option	Description
<TFTP host>	Specifies the IP address of the TFTP server. If both the <*image*> and <*config*> files are on the network, both files must reside on the same host
<TFTP pathname>	Specifies the complete path name of <*image*> or <*config*> on the remote server
-d	Reverts to the default values for <*image*> or <*config*> and nullifies any previously specified IP address and path name for the file, thus disabling Directed Netboot

Examples of Using the bconfig Command

1. Configure the default Netboot procedure. Boot from the software image file in local flash memory and use BootP to get the configuration file from the network.

   bconfig -d image (or **bconfig image local**)
   bconfig -d config (or **bconfig config network**)

2. Use Netboot for both the boot image file and the configuration file.

   bconfig image network
   bconfig config network

3. Use a local configuration file and Directed Netboot to boot the kernel file.

   bconfig image network 21.3.5.62 /usr/mykernel.exe
   bconfig config local

4. Boot from the local software image file and use Directed Netboot to get the configuration file from the network.

   bconfig image local
   bconfig config network 21.3.5.62 /usr/anstartup/config

5. Use Directed Netboot for both the boot image file and the configuration file.

   bconfig image network 21.3.5.62 /usr/mykernel.exe
   bconfig config network 21.3.5.62 /usr/anstartup/config

Setting the Netboot Interface Configuration

This section describes how to use the **ifconfig** command to configure a BayStack router interface to support netboot options.

A BayStack router netboots over one of its serial, Ethernet, or token ring (ARN only) interfaces. Because a router interface must have an IP address to communicate in an IP network, the netboot interface must have a valid IP address.

You have two options for assigning an IP address to an interface:

- Configure the upstream router to support automated addressing for EZ-Install.

  Chapter 3 describes how to configure the upstream router to support EZ-Install by creating the BootP client interface table. “The Boot Process” on page 1-5 describes how the router automatically obtains an IP address during the EZ-Install process.

- Use the **ifconfig** command to configure a serial, Ethernet, or token ring interface for Netboot or Directed Netboot.

  The following sections describe the **ifconfig** command formats.

Configuring a Serial Interface for Network Booting

To configure a serial interface for network booting, enter the following command at the Technician Interface or AN Monitor prompt:

Note: The serial interface must be configured with IP to support netboot options.

ifconfig [*serial options*] *<interface>* [*<IP address> <subnet mask>* [*<next hop address>*]]

Insert a space to separate each command option from the next.

The *serial options* variable represents some combination of the following options:

[**-d** | **-fr** [**-annexd** | **-lmi** | **-annexa**] | **-int_clk**]

Table 4-2 describes the **ifconfig** command options for configuring the router’s serial interface.

Table 4-2. ifconfig Command Options for a Serial Interface

Option	Description
-d	Resets the BayStack router's IP interface options to the default values. This option tries four WAN configurations in the following order, until it finds the correct type for the router's connection to the network: 1. Bay Networks HDLC encapsulation (also called Bay Networks Standard PPP) with external clocking 2. Frame Relay Annex D 3. Frame Relay LMI 4. Frame Relay Annex A
-fr	Configures the BayStack router's serial port as a Frame Relay connection. With this option, use one of the following options to specify a DLCMI option: **-annexd**, **-annexa**, or **-lmi**.
-annexd **-annexa** **-lmi**	When one of these options is used with the **-fr** option, it specifies a DLCMI option. Use the same option as the network to which the BayStack router's Frame Relay interface is connected. The default option for Frame Relay is **-annexd**.
-int_clk	Sets the serial port to internal clocking at 1.25 MB/s. If you do not specify this option, the router defaults to external clocking.
<interface>	Specifies the IP connector you are configuring. Use the format **com**<*port no.*>.
<IP address>	Specifies the IP address of the interface you set with *<interface>*. Provide this address in dotted-decimal notation.
<subnet mask>	Specifies the IP subnet mask of the interface you set with *<interface>*. Provide this address in dotted-decimal notation.
<next hop address>	Specifies the IP address of the next-hop router. Provide this address in dotted-decimal notation. Specify this address only if there are intermediate routers between the BayStack router and the BootP server.

Configuring an Ethernet Interface for Network Booting

To configure an Ethernet interface for network booting, enter the following command at the Technician Interface or AN Monitor prompt:

Note: The Ethernet interface must be configured with IP to support netboot options.

ifconfig [**-d**] *<interface>* [*<IP address>* *<subnet mask>* [*<next hop address>*]]

Table 4-3 describes the **ifconfig** command options for configuring the BayStack router's Ethernet interface.

Table 4-3. ifconfig Command Options for an Ethernet Interface

Option	Description
-d	Resets the BayStack router's IP interface options to the default values. Resetting an Ethernet interface makes it inactive in the network booting process. (The output of the **getcfg** command shows the default as None.)
<interface>	Specifies the IP connector you are configuring. Use the format **xcvr**<*port no.*>.
<IP address>	Specifies the IP address of the interface you set with *<interface>*. Provide this address in dotted-decimal notation.
<subnet mask>	Specifies the IP subnet mask of the interface you set with *<interface>*. Provide this address in dotted-decimal notation.
<next hop address>	Specifies the IP address of the next-hop router. Provide this address in dotted-decimal notation. Specify this address only if there are intermediate routers between the BayStack router and the BootP server.

Configuring an ARN Token Ring Interface for Network Booting

To configure an ARN token ring interface for network booting, enter the following command at the Technician Interface or AN Monitor prompt:

Note: The token ring interface must be configured with IP to support netboot options.

ifconfig [**-d**] [**-r**<*speed*>] *<interface>* [*<IP address> <subnet mask>* [*<next hop address>*]]

Table 4-4 describes the **ifconfig** command options for configuring the ARN's token ring interface.

Table 4-4. ifconfig Command Options for an ARN Token Ring Interface

Option	Description
-d	Resets the ARN's IP interface options to the default values. Resetting a token ring interface makes it inactive in the network booting process. (The output of the **getcfg** command shows the default as None.)
-r<*speed*>	Specifies the speed of the token ring interface. Specify either **16** or **4** (Mb/s). The default is 16 Mb/s.
<interface>	Specifies the IP connector you are configuring. Use the format **mau**<*port no.*>.
<IP address>	Specifies the IP address of the interface you set with *<interface>*. Provide this address in dotted-decimal notation.
<subnet mask>	Specifies the IP subnet mask of the interface you set with *<interface>*. Provide this address in dotted-decimal notation.
<next hop address>	Specifies the IP address of the next-hop router. Provide this address in dotted-decimal notation. Specify this address only if there are intermediate routers between the ARN and the BootP server.

Enabling and Disabling Interfaces with the ifconfig Command

To enable or disable a BayStack router interface for network booting, enter the appropriate command at the Technician Interface or AN Monitor prompt:

ifconfig -disable *<interface>*
ifconfig -enable *<interface>*

The *interface* variable specifies the IP connector you are enabling or disabling for network booting. Use one of the following formats:

- **xcvr***<port no.>*
- **com***<port no.>*
- **mau***<port no.>*

Examples of Using the ifconfig Command

1. Configure the current interface for the default Netboot procedure.

   ifconfig -d

2. Specify the IP address and subnet mask of the first Ethernet Netboot interface.

   ifconfig xcvr1 21.3.5.62 255.255.255.0

3. Specify the IP address and subnet mask of the second Ethernet Netboot interface.

   ifconfig xcvr2 21.3.5.61 255.255.255.0

4. Configure the IP address and Frame Relay DLCMI of the third serial Netboot interface.

   ifconfig com3 21.3.5.62 -fr -annexa

5. Specify the IP address and subnet mask of the first token ring interface on an ARN.

   ifconfig mau1 21.3.4.77 255.255.255.0

Verifying Your Configuration

You can use the **getcfg** command to verify the following:

- Whether the router is set to boot using a local or remote boot image
- Whether the router is set to configure using a local or remote configuration file
- The configuration of the serial, Ethernet, and token ring (ARN only) interfaces

To display the configured startup options for a BayStack router, enter the following command at the Technician Interface or AN Monitor prompt:

getcfg

The following sample output shows the default configuration for an AN/ANH with one Ethernet interface and two serial interfaces:

```
Boot Options

    boot image=local
    boot config=network

Netboot Parameters:

    XCVR1..None
    COM1...EZ-Install
    COM2...EZ-Install
```

The following sample output shows the configuration for an ARN with one Ethernet interface, one token ring interface, and five serial interfaces:

```
Boot Options

    boot image=local
    boot config=network

Netboot Parameters:

    MAU1...None
    XCVR2..None
    COM1...EZ-Install
    COM2...EZ-Install
    COM3...EZ-Install
    COM4...EZ-Install
    COM5...EZ-Install
```

What to Do Next

You can now boot the BayStack router over the network, assuming that you have done the following:

- Configured a UNIX workstation to support network booting, as described in Chapter 2
- Prepared configuration and boot image files and placed them in the appropriate locations for your boot configuration, as described in Chapter 3

Whenever you boot the router, it should start routing traffic as specified in the configuration file it obtains from the BootP server.

To determine whether the BayStack router is routing traffic, use the Site Manager Statistics Manager tool to view traffic statistics and the Events Manager tool to view the event log. For instructions on using these tools, see *Configuring and Managing Routers with Site Manager.*

If the BayStack router does not start routing traffic after booting, see Appendix B, "Troubleshooting Network Boot Problems."

Chapter 5
Managing ANH Repeater Ports

This chapter describes how you use Site Manager to manage ANH repeater ports.

Topic	Page
Enabling and Disabling ANH Repeater Ports	5-2
Testing and Resetting ANH Repeater Ports	5-5

Enabling and Disabling ANH Repeater Ports

You can use Site Manager to enable or disable the ANH repeater ports.

Site Manager Procedure	
You do this	**System responds**
1. In the Site Manager main window, choose **Tools**.	The Tools menu opens.
2. Choose **Configuration Manager**.	The Configuration Manager menu opens.
3. Choose **Dynamic**.	The Configuration Manager window opens, displaying the real-time router hardware and software configuration.
4. Choose **Platform**.	The Platform menu opens.
5. Choose **Setup Repeater**.	The Setup Repeater menu opens.
6. Choose **Port Status**.	The Port Status window opens, allowing you to enable or disable the ports on the router. Figure 5-1 shows the Port Status window for the 8-port ANH. Figure 5-2 shows the Port Status window for the 12-port ANH.
7. To change the status of a port, click on **Enabled** or **Disabled** to the right of the port number.	
8. Click on **OK**.	Site Manager closes the Port Status window and saves your changes.

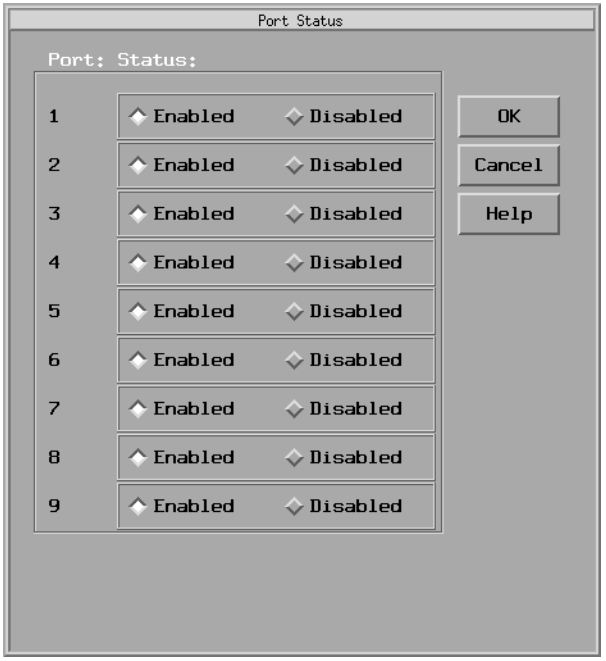

Figure 5-1. 8-Port ANH Port Status Window

Note: Port 9 is the Ethernet AUI from the ANH baseboard to the repeater. To disable the Ethernet circuit, click on **Disabled** for port 9.

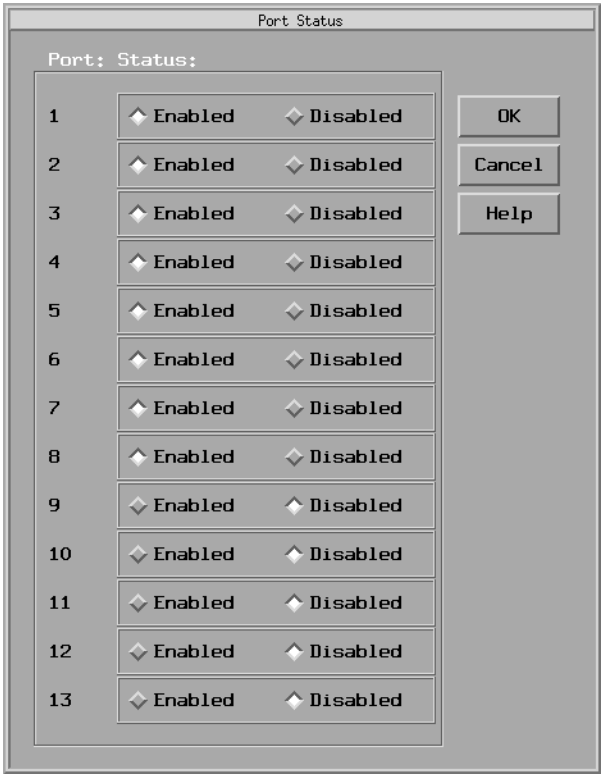

Figure 5-2. 12-Port ANH Port Status Window

Note: Port 13 is the Ethernet connection from the ANH baseboard to the repeater. To disable the Ethernet circuit, click on **Disabled** for port 13.

Testing and Resetting ANH Repeater Ports

You can use Site Manager to test and reset ANH repeater ports.

Site Manager Procedure	
You do this	**System responds**
1. In the Site Manager main window, choose **Tools**.	The Tools menu opens.
2. Choose **Configuration Manager**.	The Configuration Manager menu opens.
3. Choose **Dynamic**.	The Configuration Manager window opens, displaying the real-time router hardware and software configuration.
4. Choose **Platform**.	The Platform menu opens.
5. Choose **Setup Repeater**.	The Setup Repeater menu opens.
6. Choose **Group Parameters**.	The Group Parameters window opens.
7. Set the following parameters: • **Reset** • **Selftest** Click on **Help** or refer to the parameter descriptions beginning on page A-9.	The Configuration Manager tests each repeater port and indicates in a log file whether the ports pass the diagnostics.
8. Click on **OK**.	Site Manager executes the action(s) specified in the Group Parameters window and then closes the window.

Note: The repeater port self-test does not disrupt traffic flow. Resetting a repeater port does disrupt traffic flow; however, it does not affect the management counters defined in the RFC 1516 MIB specification.

Appendix A
Site Manager Parameters

This appendix contains reference information for the Site Manager remote access parameters.

Topic	Page
Netboot and Directed Netboot Parameters	A-2
Netboot Interface Parameters	A-4
BootP Relay Agent Interface Parameters	A-7
BootP Client Interface Address Parameters	A-8
Repeater Port Group Parameters	A-9

For each parameter, this appendix provides the following information:

- Parameter name
- Configuration Manager menu path
- Default setting
- Valid parameter options
- Parameter function
- Instructions for setting the parameter
- MIB object ID

Netboot and Directed Netboot Parameters

Parameter: **Boot Image From Network**

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Global

Default: Disable

Options: Enable │ Disable

Function: Enables or disables retrieval of the boot image from the BootP server the next time the router starts up.

Instructions: Set to Disable if you want to boot using the image in the router's local file system. This setting reduces the time it takes to boot the router and eliminates using network resources to obtain the image.

Set to Enable if:

- You want the router to obtain the image from a BootP server and you have already set up the network to support BootP.
- You are upgrading the image on several routers. The routers can then boot using a single image on the BootP server. Make sure that the directory name in the *bootptab* file matches the location of the upgraded image before you boot the routers.

MIB Object ID: 1.3.6.1.4.1.18.3.3.2.10.1.1

Parameter: **Boot Config From Network**

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Global

Default: Enable

Options: Enable │ Disable

Function: Enables or disables retrieval of the configuration file from the BootP server the next time the router starts up.

Instructions: Set to Disable if you have already saved the configuration file to the router's flash memory file system, and you want to boot using this configuration file. This setting reduces the time it takes to boot the router and eliminates using network resources to obtain the configuration file.

Set to Enable if you want the router to obtain the configuration file from a BootP server and you have already set up the network to support BootP.

MIB Object ID: 1.3.6.1.4.1.18.3.3.2.10.1.2

Parameter: **Boot Server Address**

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Global

Default: None

Options: A valid IP address of a TFTP server

Function: When the Boot Image From Network parameter and/or the Boot Config From Network parameter are set to Enable, this parameter specifies the TFTP server from which the router will obtain the boot image and configuration files.

Instructions: Use this parameter only when configuring Directed Netboot. Specify the valid IP address of the TFTP server, in dotted-decimal notation.

MIB Object ID: 1.3.6.1.4.1.18.3.3.2.10.1.3

Parameter: **Boot Image Pathname**

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Global

Default: None

Options: A valid path name for the boot image file

Function: When the parameter Boot Image From Network is set to Enable, this parameter specifies the full path name of the boot image file on the TFTP server.

Instructions: Use this parameter only when configuring Directed Netboot. Make sure that the file you specify is the valid boot image file on the TFTP server.

MIB Object ID: 1.3.6.1.4.1.18.3.3.2.10.1.4

Parameter: **Boot Config Pathname**

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Global

Default: None

Options: A valid path name for the configuration file

Function: When the parameter Boot Config From Network is set to Enable, this parameter specifies the full path name of the boot configuration file on the TFTP server.

Instructions: Use this parameter only when configuring Directed Netboot. Make sure that the file you specify is the valid configuration file on the TFTP server.

MIB Object ID: 1.3.6.1.4.1.18.3.3.2.10.1.5

Netboot Interface Parameters

Parameter: Slot

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Interfaces > Add

Default: None

Options: 1

Function: Specifies the physical slot in which the hardware module is installed.

Instructions: Specify 1 as the slot. BayStack routers have only one slot.

Parameter: Connector

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Interfaces > Add

Default: None

Options: COM1 | COM2 | COM3 | COM4 | COM5 | XCVR1 | XCVR2 | TOKEN1 | TOKEN2

Function: Specifies the name of the connector configured for the Netboot interface.

Instructions: Specify COM1, COM2, COM3, COM4, or COM5 to configure Netboot over a synchronous interface.

Specify XCVR1 or XCVR2 to configure Netboot over an Ethernet interface.

Specify TOKEN1 or TOKEN2 to configure Netboot over a token ring interface (ARN only).

Note that the interfaces that are available depend on the interface options you purchased with your router.

Parameter: Connector IP Address

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Interfaces

Default: None

Options: Any valid IP address

Function: Specifies the IP address of this interface.

Instructions: Specify the IP address of this interface in dotted-decimal notation.

MIB Object ID: 1.3.6.1.4.1.18.3.3.2.10.3.1.4

Parameter: **Connector Subnet Mask**

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Interfaces

Default: None

Options: Any valid IP subnet mask

Function: Specifies the network and subnetwork portion of the 32-bit IP address of this interface. The Configuration Manager automatically calculates an appropriate subnet mask, depending on the class of the network to which the interface connects. However, you can change the subnet mask using this parameter.

Instructions: Accept the assigned subnet mask, or specify one in dotted-decimal notation.

MIB Object ID: 1.3.6.1.4.1.18.3.3.2.10.3.1.5

Parameter: **Connector Next Hop**

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Interfaces

Default: None

Options: Any valid IP address

Function: Specifies the IP address of the next-hop router connected to this interface. When the router starts up, the next-hop router passes the BootP requests and responses that initiate the transfer of the image and/or configuration file between the router and the BootP server. If the router and BootP server are on the same IP subnet, you do not have to set this parameter.

Instructions: Specify the IP address of the next-hop router connected to this interface in dotted-decimal notation.

MIB Object ID: 1.3.6.1.4.1.18.3.3.2.10.3.1.6

Parameter: **Connector Protocol Mask**

Path: Configuration Manager > Protocols > Global Protocols > Net Boot > Interfaces

Default: Point to Point

Options: Point to Point | Point to Point Internal Clock | Fr Relay Annexd | Fr Relay Annexa | Fr Relay LMI

Function: During the boot process, the router configures the synchronous interface for the specified protocol.

Instructions: Specify the desired protocol option.

MIB Object ID: 1.3.6.1.4.1.18.3.3.2.10.3.1.7

Parameter:	**Connector State**
Path:	Configuration Manager > Protocols > Global Protocols > Net Boot > Interfaces
Default:	Enable
Options:	Enable | Disable
Function:	Enables or disables Netboot on this interface. When set to Enable, any settings specified for the other four parameters in the Netboot Interfaces window appear. When set to Disable, Site Manager disregards the other parameters and the router cannot Netboot.
Instructions:	If you do not want Site Manager to use the other parameters on the Netboot Interfaces window, set this parameter to Disable. If you want Site Manager to use any of the other parameter settings in the Netboot Interfaces window, set this parameter to Enable.
MIB Object ID:	1.3.6.1.4.1.18.3.3.2.10.3.1.1

BootP Relay Agent Interface Parameters

Parameter: Input IP Address

Path: Configuration Manager > Protocols > IP > BOOTP > Relay Agent Interface Table > Forward I/F > Add

Default: None

Options: Any valid IP address

Function: Specifies the IP interface that receives BootP request packets from an external network. This interface must have BootP configured on it.

Instructions: Specify the IP address of the interface through which the router will receive BootP requests.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.8.3.2.1.3

Parameter: Output IP Address

Path: Configuration Manager > Protocols > IP > BOOTP > Relay Agent Interface Table > Forward I/F > Add

Default: None

Options: Any valid IP address

Function: Specifies the IP interface that forwards BootP request packets to an external network.

Instructions: Specify the IP address of the interface through which the router will forward BootP requests.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.8.3.2.1.4

BootP Client Interface Address Parameters

Parameter: IP Address

Path: Configuration Manager > Protocols > IP > BOOTP > Relay Agent Interface Table > Client I/F > Add

Default: None

Options: Any valid IP address

Function: Specifies the IP address of the BayStack router that is using EZ-Install. This parameter applies only to a Frame Relay PVC in group access mode.

Instructions: Specify the IP address (in dotted-decimal notation) of the BayStack router interface.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.8.1.1.1.3

Parameter: DLCI Number

Path: Configuration Manager > Protocols > IP > BOOTP > Relay Agent Interface Table > Client I/F > Add

Default: None

Options: 16 to 1007

Function: Specifies the identification number of the upstream router's PVC. The Frame Relay network uses the DLCI number to direct data from the BayStack router to the upstream router.

Instructions: Specify the number in decimal format. Use the DLCI number assigned by your Frame Relay service provider.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.8.1.1.1.2

Repeater Port Group Parameters

Parameter: Reset

Path: Configuration Manager (Dynamic mode only) > Platform > Setup Repeater > Group Parameters

Default: NO_RESET

Options: NO_RESET | RESET

Function: Resets the repeater. The Configuration Manager tests each repeater port and indicates in a log file whether the ports pass the diagnostics. The reset does not affect the management counters defined in the RFC 1516 MIB specification, nor does it affect the status of the ports. However, the reset does disrupt traffic flow.

Instructions: Accept the default, NO_RESET, or select RESET.

MIB Object ID: 1.3.6.1.2.1.22.1.1.4

Parameter: Selftest

Path: Configuration Manager (Dynamic mode only) > Platform > Setup Repeater > Group Parameters

Default: NO_SELFTEST

Options: NO_SELFTEST | SELFTEST

Function: Causes the router to perform an agent-specific test on itself. This test does not disrupt traffic flow.

Instructions: Accept the default, NO_SELFTEST, or select SELFTEST.

MIB Object ID: 1.3.6.1.2.1.22.1.1.5

Appendix B
Troubleshooting Network Boot Problems

Use the information in this appendix to resolve problems directly related to startup and connectivity with remote routers.

Topic	Page
Solving Startup Problems	B-1
Identifying Remote Connectivity Problems	B-8
Resolving Connectivity Problems	B-10
Maintaining the Router Software	B-17
Hints and Notes	B-19

Note: For other troubleshooting information, see *Troubleshooting Routers*.

Solving Startup Problems

This section helps you to isolate and solve the most common router startup problems. Proceed to the appropriate section:

- Router Fails to Get IP Address (page B-2)
- Router Fails to Netboot (page B-3)
- Router Fails to Perform Directed Netboot (page B-3)
- Router Netboots, but Fails to Load Applications (page B-3)

Router Fails to Get IP Address

If a message at the BayStack router console indicates that the router failed to get an IP address from the upstream router, or that the upstream router is unable to receive BootP requests, ensure that the network cable between the BayStack router's synchronous port and the upstream router is firmly connected. Then, refer to the instructions in one of the following sections to find and correct the problem:

- Upstream Router Not Receiving BootP Requests
- Upstream Router Not Sending BootP Responses

If you follow the instructions in these sections and cannot find and correct the problem, contact the Bay Networks Technical Solutions Center.

Upstream Router Not Receiving BootP Requests

If the upstream router is not receiving BootP requests, use the **getcfg** command to display the router parameters and the **bconfig** and **ifconfig** commands to correct them, if necessary. For instructions, see "Displaying Parameter Settings" on page B-10 and "Debugging the BootP Server" on page B-12.

Upstream Router Not Sending BootP Responses

If the upstream router is receiving BootP requests but is failing to send BootP responses, use Site Manager to verify the following:

- The upstream router's interface to the BayStack router is enabled.
- BootP is enabled on the circuit connecting the BayStack router to the upstream router.
- The upstream router's link modules and drivers are loaded.
- IP is enabled on the upstream router.
- BootP is enabled on the upstream router.
- The BootP relay agent forwarding table associated with the upstream router shows an IP address that is configured on the IP router.
- The input IP address is correct.
- If you are using EZ-Install over a Frame Relay PVC in group access mode, the upstream router's BootP client interface table is configured properly.

Router Fails to Netboot

If the BayStack router fails to receive the configuration file or boot image using a netboot option, first do the following:

- Ensure that all cables between the BayStack router and the BootP server are firmly connected.
- If using the **ifconfig** command, be sure to specify the boot image file *krnl_an.exe* for an AN/ANH or *krnl_arn.exe* for an ARN.

Then, refer to the instructions in the following sections to find and correct the problem:

- Upstream Router Not Receiving BootP Requests
- Router Not Sending BootP Responses
- BootP Server Not Sending BootP Responses

If you have not isolated the problem to a specific interface, retrieve the number of BootP packets forwarded and dropped from all routers between the BayStack router and the BootP server. See “Displaying the Number of Packets Forwarded and Dropped” on page B-16.

If you perform the instructions in these sections and cannot find and correct the problem, contact the Bay Networks Technical Solutions Center.

Upstream Router Not Receiving BootP Requests

If the upstream router is not receiving BootP requests, do the following:

1. **Issue the Technician Interface getcfg command to display the router parameters and the bconfig or ifconfig command to correct them, if necessary.**

   For instructions, see “Displaying Parameter Settings” on page B-10 and “Debugging the BootP Server” on page B-12.

2. **Ensure that the BayStack router’s netboot interface is cabled properly.**

   For EZ-Install, ensure that the synchronous port is cabled to the upstream router. For Netboot or Directed Netboot, ensure that the configured synchronous, Ethernet, or ARN token ring interface is cabled to the IP network.

Router Not Sending BootP Responses

If a router between the BayStack router and the BootP server is receiving BootP requests but is failing to send BootP responses, do the following:

1. **Use Site Manager to ensure that the BootP relay agent forwarding table associated with the router shows an IP address that is configured on the IP router.**
2. **Ensure that the input IP address is correct. If the Hops count is lower than the router's position in the path, increase the Hops count.**

   For instructions, see "Creating the BootP Client Interface Table" on page 3-13.
3. **Use the Configuration Manager to ensure that BootP and IP are enabled on the incoming and outgoing interfaces.**
4. **Ensure that the link modules and drivers are enabled.**

   For instructions, see *Configuring and Managing Routers with Site Manager*.

BootP Server Not Sending BootP Responses

If the BootP server is receiving BootP requests but is failing to respond to them, do the following:

1. **Follow the instructions in "Displaying the BootP Server IP Routes" on page B-15.**
2. **Follow the instructions in "Debugging the BootP Server" on page B-12.**
3. **Ensure that the *etc/inetd.conf* file contains no more than one `bootps` entry.**

   If there is more than one entry, comment out the invalid entry. The valid entry is as follows:

   ```
   bootps dgram udp wait root /etc/bootpd bootpd
   ```
4. **Ensure that the `tftp dgram` entry in the *etc/inetd.conf* file is correct for your system.**

   For instructions, see "Setting Up a TFTP Server" on page 2-8.
5. **See "Verifying the BootP Server Setup" on page B-14.**

Router Fails to Perform Directed Netboot

If the BayStack router fails to perform Directed Netboot, verify the following:

- The interface that connects the router to the TFTP file server is configured with an IP address.
- All required files reside on the TFTP file server.
- The boot image file is *krnl_an.exe* for an AN/ANH or *krnl_arn.exe* for an ARN.

Contact the Bay Networks Technical Solutions Center if you cannot find and correct the problem.

Router Netboots, but Fails to Load Applications

If the BayStack router netboots a kernel file successfully, but displays an error message indicating that it cannot load specific applications, it is unable to retrieve files from the TFTP server that were provided on the software image. These files are required to perform functions such as running the protocols specified in the configuration file and displaying the log.

To troubleshoot a failure to load applications, do the following:

1. **Ensure that, after booting, you have at least one interface configured through which the file server that supplied the kernel file can be reached.**

   This is required for a router that has obtained its software image over the network to load application or string files.

2. **Ensure that all the application and string files (files with *.exe* and *.str* file-name extensions) reside in the same directory as the kernel file.**

3. **Verify that you have TFTP configured on the BayStack router. To do this, display the router's `loadmap` screen message.**

   If *tftp.exe* is missing, load it on the router.

4. **Use Site Manager to ensure that IP is enabled and that TFTP is configured in the BayStack router configuration file.**

   See "Verifying the BootP Server Setup" on page B-14.

5. **Use Technician Interface commands to verify or correct the status of the synchronous, Ethernet, or token ring connectors used for network booting.**

   For instructions, see *Using Technician Interface Software*. Examples of BayStack router commands and responses follow, as well as some connector and interface settings you should consider.

   - Enter the following command to display the BayStack router driver:

     get wfLinkModules.15.0

     On an AN/ANH, the response is as follows:

     ```
     wfLinkModules.wfANLoad.0 = 2147483648
     ```

     On an ARN, the response is as follows:

     ```
     wfLinkModules.wfARNLoad.0 = 2147483648
     ```

     The response indicates that the BayStack router driver is configured to run in slot 1 (the only BayStack router slot).

     The decimal number `2147483648` represents slot 1. If the setting is not `2147483648`, enter one of the following commands to correct it:

     set wfLinkModules.15.0 2147483648;commit (for AN/ANH)
     set wfLinkModules.25.0 2147483648;commit (for ARN)

     To display the configured drivers, enter the following command:

     get wfDrivers.*.0

     A combination of the following settings should appear in the list of drivers, according to your BayStack router configuration:

`wfDrivers.wfQsccSyncLoad.0 = 2147483648`	COM ports
`wfDrivers.wfQsccEnetLoad.0 = 2147483648`	Ethernet ports (nonrepeating)
`wfDrivers.wfRptrLoad.0 = 2147483648`	Ethernet repeater ports (ANH only)
`wfDrivers.wfTMS380Load.0 = 2147483648`	Token ring ports

Use the **set** command to correct settings, if necessary. For example, if the router has a token ring port and the `wfDrivers.wfTMS380Load.0` setting is not `2147483648`, enter the following command to correct it:

set wfDrivers.wfTMS380Load.0 2147483648;commit

- If the router is netbooting with a synchronous interface, enter the following command to display information about the interface, where <*connector*> is the interface connector number:

  get wfSyncEntry.*.1.<*connector*>

  Ensure that external clocking is set.

- If the router is netbooting with an Ethernet interface, enter the following command to display information about the interface, where <*connector*> is the interface connector number:

  get wfCSMACDEntry.*.1.<*connector*>

- If the router is netbooting with a token ring interface, enter the following command to display information about the interface, where <*connector*> is the interface connector number:

  get wfTokenRingEntry.*.1.<*connector*>

Identifying Remote Connectivity Problems

The sections that follow provide guidelines for isolating a router addressing problem or a netboot problem. Proceed to the appropriate section:

- Displaying Messages from the BayStack Router Console (page B-8)
- Displaying Statistics and Error Messages (page B-8)
- Guidelines for Using Packet Capture (page B-9)
- Guidelines for Using a LAN Protocol Analyzer (page B-9)

Displaying Messages from the BayStack Router Console

If you cannot connect to the BayStack router using Site Manager, Bay Networks recommends that you use a modem or terminal console to connect to the router using the Technician Interface.

If you cable a modem to the BayStack router, you can dial in and connect to the router remotely. This setup provides the same capabilities as an on-site console connection. Modem communications, however, are slower.

Viewing a BayStack router error message and entering commands using a modem connection may simplify troubleshooting if you are not at the BayStack router site. As an alternative, you can ask the person at the BayStack router site to read the console messages to you and then you can tell that person which commands to enter.

Displaying Statistics and Error Messages

Use the Statistics Manager Quick Get tool or the Technician Interface **get** command to display the number of BootP and TFTP packets forwarded and dropped for each interface in the path between the BayStack router and the BootP server.

Use the Events Manager or the Technician Interface **log** command to display the events associated with the interface and the BootP and TFTP protocols.

For instructions on using the Quick Get tool and the Events Manager, see *Configuring and Managing Routers with Site Manager.* For a description of events that appear in the log, see *Event Messages for Routers.* For instructions on using the **get** and **log** commands, see *Using Technician Interface Software*.

Guidelines for Using Packet Capture

Use the Packet Capture utility to view incoming or outgoing BootP or TFTP packets and isolate errors to a specific router interface. This utility is available through the Technician Interface on routers running BayRS Version 7.80 or later.

See *Using Technician Interface Software* for instructions on how to use Packet Capture. See *Configuring SNMP, BootP, DHCP, and RARP Services* for a description of BootP packets.

Note: The instructions that follow assume that BayRS Version 7.80 or later is running on all routers in the path between the BayStack router and the BootP server.

Use Packet Capture as follows:

1. **Test the BootP server's next-hop router in the path to the BayStack router.**
2. **Test the upstream router's interface to the BayStack router.**
3. **Test the upstream router's interface to the next-hop router.**
4. **Test the interfaces that receive and forward the BootP and TFTP packets of the routers between the BayStack router and the next-hop router.**
5. **Continue testing each router in the path until you isolate the problem interface.**

Guidelines for Using a LAN Protocol Analyzer

See the following guidelines when you use a LAN protocol analyzer:

- If the netboot is failing, connect the analyzer to the BootP server interface to determine whether it is receiving and responding to BootP and TFTP requests.

  To read the ASCII translation, view the BootP reply packets for the configuration file path name in hexadecimal mode.

Note: The LAN protocol analyzer does not decode all of the vendor tag fields.

- If the BootP server is not receiving requests, ensure that the upstream router is receiving and forwarding them. If the upstream router is receiving, verify that each router interface between the upstream router and the BootP server is receiving and forwarding the requests.

  If the BootP server is receiving requests but is failing to respond, see "Router Fails to Netboot" on page B-3.

Resolving Connectivity Problems

This section describes how to:

- Display the BayStack router's netboot configuration
- Debug the BootP server
- Verify the BootP server's setup
- Display the BootP server's IP routes
- Display the number of BootP packets forwarded and dropped

Displaying Parameter Settings

Display the BayStack router's netboot parameter settings to determine the following:

- Whether the BayStack router is set to boot using a local boot image or a remote boot image
- Whether the BayStack router is set to configure using a local configuration file or a remote configuration file
- The configuration of the synchronous, Ethernet, and token ring (ARN only) connectors

Enter the following Technician Interface command to display the BayStack router's startup options:

getcfg

The following sample response shows the default settings for an AN/ANH with one Ethernet interface and two synchronous interfaces:

```
Boot Options

    boot image=local
    boot config=network

Netboot Parameters:

    XCVR1..None
    COM1...EZ-Install
    COM2...EZ-Install
```

The following sample response shows the settings for an ARN with one Ethernet interface, one token ring interface, and five synchronous interfaces:

```
Boot Options

    boot image=local
    boot config=network

Netboot Parameters:

    MAU1...None
    XCVR2..None
    COM1...EZ-Install
    COM2...EZ-Install
    COM3...EZ-Install
    COM4...EZ-Install
    COM5...EZ-Install
```

The possible settings for `boot image` and `boot config` are `network` and `local`. If the setting is `network`, the BayStack router requests the kernel file or configuration file from a BootP server when booting. If the setting is `local`, the BayStack router uses the kernel file or configuration file stored in flash memory.

The XCVR parameter shows the current setting of the Ethernet connectors. The COM parameters show the current settings of the synchronous connectors. The MAU parameter shows the setting of the token ring connectors (ARN only).

The possible settings for synchronous connectors are as follows:

- `EZ-Install` (the default setting)
- The IP address, next-hop IP address, subnet mask, and WAN protocol (Bay Networks Standard PPP or Frame Relay)

The possible settings for Ethernet connectors are as follows:

- `None` (the default setting)
- The IP address with subnet mask and next-hop IP address (if you configured one)

The possible settings for token ring connectors are as follows:

- `None` (the default setting)
- The IP address with subnet mask, ring-speed option, and next-hop address (if you configured one)

See Chapter 4 for instructions on using the **ifconfig** and **bconfig** commands to change the parameter settings.

Debugging the BootP Server

Debug the BootP server as follows:

1. **Enter the following command at the UNIX command line:**

   bootpd -d -d&

   The *bootpd* debugger tool reads the */etc/bootptab* file and generates the */etc/bootpd.dmp* file. The */etc/bootpd.dmp* file contains the portion of the */etc/bootptab* file that the *bootpd* debugger could read successfully. The debugger displays messages such as the following:

```
[1] 12914

   hostname:/etc> reading "/etc/bootptab"
   read 19 entries from "/etc/bootptab"
   dumped 19 entries to "/etc/bootpd.dump".
```

2. **Compare the** *bootptab* **file with the** *bootpd.dmp* **file.**

   If the *bootpd.dmp* file is truncated or is otherwise different from the *bootptab* file, BootPD may have encountered a syntax error. Find the inconsistency in the two files.

3. **Compare the *bootptab* file with the sample *bootptab* file in Chapter 2 (see Figure 2-1 on page 2-7) and correct any inconsistency.**
4. **If you cannot find an inconsistency, boot the router and view the *bootpd* debugger messages to determine the cause of the error.**

Table A-1 provides an example of the sequence of messages when a BootP exchange is successful.

Table A-1. BootP Messages

Message	Explanation
`hostname:/etc> request from IP addr 192.16.24.12`	The UNIX host name, the path (*/etc*) of the *bootptab* file, and the IP address of the AN
`found 192.16.24.12 AN.Boston`	The IP address (192.16.24.12) mapped to the host name, AN.Boston, in the *bootptab* file
`bootfile2 /$HOME/.builder_dir/ rel1200/an krnl_an.exe`	The path name of the kernel file, as specified in the *bootptab* file
`Couldn't access /$HOME/ .builder_dir/rel1200/an krnl_an.exe.AN.Boston`	Disregard this message. The BootP server tries to access the host by both its name and IP address. The “couldn’t access” message means that the server tried to access a host named AN.Boston, but failed because the AN is not named. The attempt to access the AN by its IP address succeeds, as you can infer from the last message.
`vendor magic field is 99.130.83.99`	Disregard this message.
`sending RFC1048-style reply`	The BootP server is sending a BootP response in compliance with RFC 1048.

Verifying the BootP Server Setup

This section describes what to do if the BootP server is receiving BootP requests but is failing to respond, or is failing to forward the kernel, configuration, application, or string files.

Verify the BootP server setup as follows:

1. **Ensure that the kernel file and all of the application (*.exe*) files are in the same directory.**

   You can place these files in any directory you want. The Image Builder automatically generates the kernel file and application files when you open the software image file. By default, the Image Builder stores these files for the AN/ANH in the */$HOME/.builder_dir/rel<rel>/an* directory, where *<rel>* is the current BayRS release for the AN/ANH. The default directory for the ARN is */$HOME/.builder_dir/rel<rel>/arn*, where *<rel>* is the current BayRS release for the ARN.

   For example, Version 6.0 of the Image Builder stores the Version 12.00 files for an ARN in the */$HOME/.builder_dir/rel12.00/arn* directory.

2. **Ensure that the router extracts the kernel file and all of the application and string files from the same software image file.**

   If these files are from different software versions, the router may fail to boot or may not operate properly.

3. **Ensure that the *bootptab* file is in the */etc* directory.**

4. **Ensure that the *bootptab* file for an AN/ANH contains the following entries:**

   ```
   general:\
       :hd=/$HOME/.builder_dir/rel<rel>/an:\
       :bf=krnl_an.exe:\
       :bs=auto:\
       :vm=rfc1048:
   ```

   The *bootptab* file for an ARN should contain these entries:

   ```
   general:\
       :hd=/$HOME/.builder_dir/rel<rel>/arn:\
       :bf=krnl_arn.exe:\
       :bs=auto:\
       :vm=rfc1048:
   ```

Note that */$HOME/.builder_dir/rel<rel>/an* is the default location of the kernel file and all application and string files for the AN/ANH. The default location of the kernel file and all application and string files for the ARN is */$HOME/.builder_dir/rel<rel>/arn*.

5. **Ensure that the *bootptab* file contains a definition for the router that is failing to netboot.**

6. **Ensure that the configuration file name and path are correct in the *bootptab* file.**

   For example, the following *bootptab* entry indicates that the configuration file named *AN_Bost.cfg* is in the */rte3/cfg* directory:

   ```
   T129="/rte3/cfg/AN_Bost.cfg"
   ```

7. **Read the *bootptab* file carefully for misspellings or other errors.**

   Compare it with the sample file shown in Chapter 2 (see Figure 2-1 on page 2-7).

Displaying the BootP Server IP Routes

To display the IP address of the next-hop router, enter the following command at the UNIX command line of the BootP server:

netstat -rn | grep -i -n *<IP_address>*

<IP_address> is the IP address of the netbooting router's network.

For example, enter **netstat -rn | grep -i -n 192.32.155** to display the IP address of the next hop to the network address 192.32.155.

If the BootP server is receiving RIP advertisements of the netbooting router's network, a message such as the following appears:

```
121:192.32.155.0    192.32.13.53   UG   0   0   le0
```

The numbers in this message indicate the following:

- `121` is the number of the entry in the workstation's static routing table.
- `192.32.155.0` is the IP address of the destination network.
- `192.32.13.53` is the address of the next-hop router.

  If the next-hop router is unavailable or incorrect, see "Setting Up Static Routes to Next-Hop Routers" in Chapter 2.

Displaying the Number of Packets Forwarded and Dropped

This section describes how to display the number of BootP packets forwarded and dropped by a router. Perform this procedure for each router between the BayStack router and the BootP server.

You can use either the Statistics Manager Quick Get tool or the Technician Interface **get** command to retrieve this information. For additional information about Quick Get, see *Configuring and Managing Routers with Site Manager.*

Quick Get Instructions

1. **Select the following path:**

   ```
   wfApplication/wfInternet/wfBootpGroup/wfBootpRelayAgentGroup/
   wfBootpRelayIntfTable
   ```

2. **To display the number of packets forwarded, select the following:**

   ```
   wfBootpRelayIntfRequests
   ```

3. **To display the number of packets dropped, select the following:**

   ```
   wfBootpRelayIntfHopsDrops
   ```

Technician Interface Instructions

Enter the following command to display information that may help you determine if and why a device is dropping packets, where <*IP_address*> is the address of the interface receiving the packets:

get wfBootpRelayIntfEntry.*.<*IP_address*>

Maintaining the Router Software

The BayStack router file system resides on the flash memory card, which is *not* user serviceable.

You use Technician Interface commands to maintain the local file system on the BayStack router flash memory card. For more information, see *Using Technician Interface Software* and *Using Technician Interface Scripts*.

Caution: Be very careful when you use the **format** command. This command erases all files on the local flash memory card, and the BayStack router will not be able to local-boot an image or configuration file until you replace the files. You can avoid this situation by partitioning the flash memory card. See *Using Technician Interface Software* or *Configuring and Managing Routers with Site Manager.*

When Technician Interface commands require that you specify a volume, always specify volume 1 for a BayStack router.

Upgrading the Software Image

You can upgrade a BayStack router's kernel file (*krnl_an.exe* for the AN/ANH or *krnl_arn.exe* for the ARN) using one or both of the following options:

- Use Netboot to start the router.

  This option upgrades the image only in the BayStack router's RAM.

- Use TFTP to transfer the image to the BayStack router's flash memory card, then use Local Boot to start the router.

  This option upgrades the image in both the BayStack router's flash memory card and in RAM.

Caution: If you use TFTP to transfer an upgraded image to a BayStack router flash memory card, and the file transfer is interrupted (for example, if the router resets, reboots, or loses power), the BayStack router's local file system on the flash memory card becomes corrupted and the router cannot boot locally until you restore the file system.

Restoring a Local File System

If the BayStack router's local file system becomes corrupted, you must restore it by upgrading the software image.

If the router resets, reboots, or loses power while restoring or compacting its flash memory card, it automatically netboots the configuration file and software image. (You must already have the network set up for Netboot or Directed Netboot to succeed.)

Note: If the BayStack router reboots while writing to or compacting *partitioned* flash memory, the file system becomes corrupted and the router will not start after rebooting.

After the router netboots successfully, you can use TFTP to restore the software image and configuration file on the local file system.

Caution: Compacting the file system on a flash memory card can take up to 15 minutes. When you compact a BayStack router's file system, allow the compaction to complete before resetting the router.

Hints and Notes

This section contains the following important information:

- Setup Hints
- Implementation Notes

Setup Hints

This section contains hints for setting up a BayStack router.

- Bay Networks recommends that you first install a BayStack router in the same site as your BootP server, Site Manager workstation, and other Bay Networks routers to test the software image, configuration file, and routing path. This test provides you with the startup and troubleshooting experience you need to perform these tasks on routers at remote sites. After you perform the test, move the test router to the remote location, modify the configuration file for that router, and set up the new paths.
- After you build and test the remote router configuration file, make copies of it on the Site Manager workstation. Then, modify the copies for each BayStack router in your network, rather than starting over. To avoid mix-ups, ensure that the file name you assign to each configuration file is unique and meaningful for each router.
- Before you set up the routing paths, it may be easier to isolate BootP and TFTP configuration errors on the network if you upgrade all Bay Networks routers between the BayStack routers and the BootP server to Version 7.80 or later.
- If you are using EZ-Install over Frame Relay to boot a BayStack router, you can have up to 20 PVCs for a single Frame Relay interface on the upstream router. If you have more than 20 PVCs on the Frame Relay interface, the EZ-Install process may fail. To ensure that the process does not fail, configure a maximum of 20 PVCs for a Frame Relay interface.
- If the BayStack router or an upstream router will have small routing or forwarding tables, you can increase performance by reducing the local memory allocation and allocating more global memory.
- If the BayStack router or an upstream router will have large forwarding tables (for example, more than 500 servers), you might want to increase the local memory allocation.

Implementation Notes

This section contains notes for operating a BayStack router at a remote site.

- If you use TFTP to upgrade or restore the router's file system, be sure to specify the software image file (*an.exe* for the AN/ANH or *arn.exe* for the ARN).
- Bay Networks supports BootP service on UNIX workstations, but not PCs. If you want to netboot and you are using a PC as your Site Manager workstation, transfer the files you want to netboot from the PC to a UNIX workstation and configure the workstation as a BootP server.
- On a BayStack router, you cannot use EZ-Install or Netboot directly from a FDDI interface. On an AN/ANH router, you cannot use EZ-Install or Netboot directly from a token ring interface.
- You need BayRS Version 8.10 or later to use Directed Netboot.
- If you have a LAN protocol analyzer available, you may want to use it to troubleshoot BootP server communication errors. (For information about using the Packet Capture utility or an analyzer to isolate these errors, see "Guidelines for Using Packet Capture" and "Guidelines for Using a LAN Protocol Analyzer" on page B-9.)
- BayRS Versions earlier than 7.80 do not include the Packet Capture utility.
- The 12-port ANH polls the internal repeater module for operational status; it does not poll individual Ethernet repeater ports for connection (link) status. Therefore, the 12-port ANH is aware of the connection between the baseboard and repeater module, but is not aware of any connection between the repeater module and the Ethernet network. If the repeater module interface state reports an operational status, the 12-port ANH may continue to transmit information through the repeater module even though a physical Ethernet connection does not exist.
- At the AN Monitor prompt, you cannot view the contents of the local file system on the flash memory card. Be sure to remember the name of the configuration file when performing a Directed Netboot from the AN Monitor prompt.
- You can issue a **boot** command from the AN Monitor prompt. Specify a local boot by entering **1:** for the volume name.

Appendix C
Using the Quick-Start Local Boot Procedure

The Quick-Start procedure connects a new BayStack router to a managed network using the Local Boot option and a default configuration file.

If you have read Chapter 1 and want to use Quick-Start to connect a BayStack router to Site Manager for the first time, use the worksheets in this appendix to gather the network information required to complete the procedure. Be sure to fill out the worksheets before you begin the Quick-Start procedure.

Topic	Page
What Is Quick-Start?	C-2
Using the Worksheets	C-2
Running the Quick-Start Script	C-13

Note: The worksheets in this appendix apply only to AN, ANH, and ARN routers. See *Quick-Starting Routers* for all other Bay Networks routers.

What Is Quick-Start?

The Quick-Start procedure is the initial startup configuration, which does the following:

- Enables IP so that the router can connect to Site Manager
- Starts a locally booted router running on the network

You perform the Quick-Start procedure by running the *install.bat* script (for an AN/ANH) or the *inst_arn.bat* script (for an ARN), and entering information at the prompts. The router automatically selects options for some prompts, and you can accept default values for many of the other prompts.

Note: The Quick-Start procedure for the ARN is nearly identical to the procedure for the AN/ANH. This appendix identifies any major differences; the hardware installation manuals include model-specific instructions for running the Quick-Start script.

Using the Worksheets

This appendix includes a series of worksheets to help you organize the network information you need for your configuration and to answer Quick-Start prompts. The worksheets contain the options for each prompt and provide space for you to record the options you select.

Note: The *install.bat* and *inst_arn.bat* scripts allow for many possible configurations. Since typical remote access uses a serial interface over a wide area connection, the worksheets provide only the options for a serial configuration. When you configure a LAN interface, base your decisions on the information provided in each *install.bat* or *inst_arn.bat* prompt.

If you are not configuring the router yourself, fill out the worksheets for a person at the router site and relay the worksheet information. Written for a person at the router site, the manuals *Installing and Operating BayStack AN and ANH Systems* and *Installing and Operating BayStack ARN Routers* include identical worksheets and instructions for completing the Quick-Start procedure.

Bay Networks recommends that you fill out the worksheets as follows:

1. **Fill out the Global Information worksheet completely.**

   This worksheet lists options common to all synchronous interface configurations.

2. **After you record your protocol selections on the Global Information worksheet, fill out *one* Router Protocol worksheet.**

   This worksheet lists options for RIP, OSPF, and static route configurations. For example, if you select RIP as your routing protocol, you need only fill out the RIP worksheet.

3. **Fill out *one* Wide Area Protocol worksheet.**

   This worksheet lists options for Bay Networks Proprietary PPP, Frame Relay, Standard PPP, and SMDS configurations. For example, if you select Frame Relay as your wide area protocol, you need only fill out the Frame Relay worksheet.

4. **Run** *install.bat* **or** *inst_arn.bat* **as described in "Running the Quick-Start Script" on page C-13.**

   Alternatively, a person at the BayStack router remote site can run the Quick-Start script using a management console modem connection.

5. **Once the router has an initial connection to the network, see** *Configuring and Managing Routers with Site Manager* **to configure the router.**

Global Information Worksheet

This section contains the prompts and options for all BayStack router synchronous configurations.

Global Information Worksheet

Prompt	Options	Your Response
`Enter the module number [1]:`	**AN/ANH only:** Because the AN/ANH is not a link module, the router bypasses this step and automatically accepts a default slot of 1. **ARN only:** The script lists the modules that you can use to connect the router's IP network interface to Site Manager. For example, the script might offer the following options: 1. Ethernet on Base Module 2. Serial on Adapter Module 1 3. Ethernet Tri-Serial on Expansion Module	Enter the number that corresponds to the module you want to use.
`Driver Type:`	If there is only one interface on the module you chose, the script automatically selects the driver type for that interface and bypasses this prompt. Otherwise, the script displays a menu of driver types. The actual menu depends on the modules you have installed.	Enter the number that corresponds to the driver for the module you selected. For serial interfaces and all WAN adapter modules, choose the synchronous driver.
`Enter connector number [1]:`	If there is only one connector on the module you chose, the script automatically assigns a connector number and bypasses this prompt. Otherwise, the script lists the available connectors. For example, for an ARN with five serial connectors, the options are as follows: 1. COM1 2. COM2 3. COM3 4. COM4 5. COM5	For information about the module locations and connector names, see Tables 3-1 to 3-4 in Chapter 3.

(continued)

Global Information Worksheet *(continued)*

Prompt	Options	Your Response
`Enter clock source number [2]:`	1. Internal 2. External	
`Enter clock speed number [10]:`	This prompt appears only if you chose an internal clock source. The script lists a range of values, with 64K as the default.	
`Enter circuit name [S#]:`	The script displays a default circuit name for the COM interface you selected (for example, S11 for COM1 and S12 for COM2).	Press the [Return] key.
`Enter IP address in dotted decimal notation:`	Enter the IP address for the COM interface.	
`Enter IP subnetwork mask in dotted decimal notation:`	Enter the subnet mask for the COM interface IP address.	
`Is the router connected to the same local area network as the Site Manager workstation? (y/n) [n]:`	y(es) n(o)	Press the [Return] key.
`Enter routing protocol number [1]:`	1. RIP 2. OSPF 3. Static Route to Site Manager	Complete the worksheet for the protocol you select.
`Enter wide area protocol number [1]:`	1. Bay Networks Point-to-Point Protocol (Proprietary) 2. Frame Relay 3. Point-to-Point Protocol (PPP) Standard 4. Switched Multimegabit Data Service (SMDS)	Complete the worksheet for the protocol you select.
`Do you wish to set SNMP community management? (y/n) [n]:`	y(es) n(o) Setting up SNMP community management is optional.	
`Enter (TFTP) volume number [1]:`	The script automatically selects 1 as the TFTP default volume.	
`Do you want to enable FTP? (y/n) [n]:`	y(es) n(o) Enabling FTP is optional.	

Global Information Worksheet *(continued)*

Prompt	Options	Your Response
`Enter (FTP) volume number [1]:`	The script automatically selects 1 as the FTP default volume.	
`Do you want to enable TI TELNET (y/n) [n]:`	y(es) n(o) Enabling Telnet is optional.	
`Do you wish to save this configuration to a file? (y/n) [y]`	y(es) n(o)	Press the [Return] key.
`Enter filename [startup.cfg]:`	Bay Networks recommends using the default file name, *startup.cfg*.	Press the [Return] key.
ARN only: `Do you wish to set up another port/module? (y/n) [y]`	y(es) n(o)	Type **n** and press the [Return] key.

Router Protocol Worksheets

This section contains the following worksheets, with the prompts and options for routing protocol choices on the Global Information worksheet:

- RIP Worksheet (page C-6)
- OSPF Worksheet (page C-7)
- Static Route to Site Manager Worksheet (page C-9)

RIP Worksheet

Prompt	Options	Your Response
`Should RIP listen to the default route? (y/n) [n]:`	y(es) n(o) **Note:** RIP listens to the static route (a specific network or subnet route to the Site Manager location). Answering y(es) to this prompt forces RIP to also listen to the default route (0.0.0.0). This is useful when the RIP updates that the BayStack router receives do not include the static route.	

OSPF Worksheet

Prompt	Options	Your Response
`Enter OSPF router ID in dotted decimal notation:`	Enter an IP address to uniquely identify the router in the OSPF domain. The script provides the IP address of the COM port as the default. Bay Networks suggests using the default IP address. **ARN only:** When using the script to configure OSPF on more than one COM port, do not accept the default IP address. Enter the same address for each port.	
`Enter the OSPF area ID in dotted decimal notation [0.0.0.0]:`	Enter the area ID. This ID must match the area ID of the router's neighbor. **Note:** The backbone area ID is always 0.0.0.0.	
`Enable Simple Password authentication? (y/n) [n]:`	y(es) n(o) **Note:** If you answer y(es), the router requests a password.	Password: _____
`Follow default paths for unknown subnets? (y/n) [n]:`	y(es) n(o)	
`Enter OSPF MTU size selection [1]:`	1. Default 2. Ethernet size (Bay Networks Series 5 compatible) 3. User Defined MTU	
`Enter OSPF interface type selection [1]:`	1. Broadcast 2. NBMA 3. Point-to-Point 4. Point-to-Multipoint (Proprietary) 5. Point-to-Multipoint (Per OSPF Standard) **Note:** When using a wide area protocol other than Bay Networks Proprietary PPP, Bay Networks suggests selecting NBMA.	

OSPF Worksheet *(continued)*

Prompt	Options	Your Response
`Enter decimal value in seconds for Hello Interval [10]:`	The script suggests the following intervals: Broadcast -- 10 seconds Point-to-Point -- 15 seconds NBMA -- 20 seconds Point-to-Multipoint --10 seconds **Note:** This value must match all other interfaces in the OSPF area for the connection to occur.	
`Enter decimal value in seconds for Router Dead Interval [40]:`	The script suggests the following intervals: Broadcast -- 40 seconds Point-to-Point -- 60 seconds NBMA -- 80 seconds Point-to-Multipoint (STD) -- 40 seconds **Note:** This value must match all other interfaces in the OSPF area for the connection to occur.	
`Enter decimal value for Router Priority [1]:` (For Broadcast, NBMA, or Point-to-Multipoint)	Enter a router priority value. The lower the value (above zero), the higher the priority. **Note:** If you set the router priority to zero (0), the router is not eligible to become the designated router on this network.	
`Enter decimal value in seconds for Poll Interval [20]:` (For NBMA only)	Enter the maximum number of seconds between the Hello packets that the router sends to an inactive NBMA neighbor. The script suggests a 20-second interval.	
`Enter IP address of neighbor in dotted decimal notation or enter q to quit:` (For NBMA only)	Enter addresses for all NBMA neighbors you want the router to communicate with. When you finish entering addresses, type **q** to quit.	
`Enter IP address of neighbor in dotted decimal notation:` (For PPP only)	Enter addresses for the PPP neighbors you want the router to communicate with.	

Static Route to Site Manager Worksheet

Prompt	Options	Your Response
`Destination Network [0.0.0.0]:`	Enter the gateway address of the destination network. An address of 0.0.0.0 specifies the default route.	
`Destination Network Mask [0.0.0.0]:`	Enter the subnet mask of the destination network. A mask of 0.0.0.0 specifies the default route.	
`Next-Hop Address:`	Enter a next-hop address. All static routes require a next-hop address in the same subnet as the initial IP interface.	
`Follow the default route for unknown subnets? (y/n) [n]:`	y(es) n(o) The default route does not apply for subnets unless you type **y** at this prompt.	

Wide Area Protocol Worksheets

This section contains the following worksheets, with the prompts and options for wide area protocol choices on the Global Information worksheet:

- Bay Networks Proprietary PPP Worksheet (page C-10)
- Frame Relay Worksheet (page C-11)
- PPP Worksheet (page C-11)
- SMDS Worksheet (page C-13)

Bay Networks Proprietary PPP Worksheet

Prompt	Options	Your Response
`Enter BofL (Breath of Life) timer value (1-60) [5]:`	Enter the maximum amount of time between the transmission of BofL messages.	
`Enter Local Address selection [3]:`	1. DCE 2. DTE 3. EXPLICIT **Note:** Reverse the local and remote address values when configuring the device at the other end of the circuit. (Exception: When connecting to a Bay Networks Series 5 router that uses DCE/DTE addressing, use the same local address value.)	
`Enter Remote Address selection [3]:`	1. DCE 2. DTE 3. EXPLICIT **Note:** Reverse the local and remote address values when configuring the device at the other end of the circuit. (Exception: When connecting to a Series 5 router that uses DCE/DTE addressing, use the same remote address value.)	

(continued)

Frame Relay Worksheet

Prompt	Options	Your Response
`Enter Management type [3]:`	1. DLCMI None 2. Rev 1 LMI 3. ANSI T1 617D 4. CCITT Annex A 5. LMI Switch 6. Annex D Switch 7. Annex A Switch	
`Enter addressing type [4]:`	1. ADDR Q.921 2. ADDR Q.922 (MARCH '90) 3. ADDR Q.922 (NOVEMBER '90) 4. ADDR Q.922	
`Enter address field length [2]:`	2. Two Bytes 3. Three Bytes 4. Four Bytes	
`Enter DLCI number [30]:` (For DLCMI None, LMI Switch, Annex D Switch, and Annex A Switch only)	Enter the permanent virtual circuit (PVC) number. **Note:** The valid range for the DLCI number is 16 to 1007.	

PPP Worksheet

Prompt	Options	Your Response
`Enter Remote IP address in dotted decimal notation:`	Enter the IP address of the peer connection.	
`Do you wish to turn on the PPP echo function? (y/n) [n]:`	y(es) n(o)	
`Enable PAP (Password Authentication Protocol)? (y/n) [n]:`	y(es) n(o) **Note:** If you answer y(es), the script requests a PAP ID and password for this interface. If you answer n(o), it prompts you to enable CHAP.	

(continued)

PPP Worksheet *(continued)*

Prompt	Options	Your Response
`Enable CHAP (Challenge Handshake Authentication Protocol)? (y/n) [n]:`	y(es) n(o) **Note:** If you answer y(es), the script requests a CHAP secret for this interface.	
`Does the Remote Peer have PAP authentication enabled? (y/n) [n]:`	y(es) n(o) **Note:** If you answer y(es), the script requests the PAP ID and password for the remote interface.	
`Enable the LQR (Link Quality Reporting) Protocol? (y/n) [n]:`	y(es) n(o) See *Configuring PPP Services* for information about the Link Quality Reporting (LQR) protocol and LQR packets.	
`Enable use of the Remote Peer router's LQR Timer? (y/n) [y]:` (For LQR only)	y(es) n(o) Type **y** if the remote peer router maintains its own LQR timer for this interface. Type **n** if the BayStack router is responsible for maintaining the timer for this interface.	
`Number of seconds (1-120) [3]:` (For LQR only)	Enter the maximum number of seconds between the transmission of LQR packets.	
`Enter [inbound] success rate percentage (1-100) [90]:`	Enter the minimum acceptable success rate (percentage) of packets transmitted by the peer router and received on this interface over the last five LQR periods.	
`Enter [outbound] success rate percentage (1-100) [90]:`	Enter the minimum acceptable success rate (percentage) of packets transmitted by this interface and received by the peer router over the last five LQR periods.	

SMDS Worksheet

Requested Information	Options	Your Response
`Enter 10-digit individual address:`	Enter the individual address assigned by your SMDS service provider.	
`Enter 10-digit group address:`	Enter the group address assigned by your SMDS service provider.	
`Enter 10-digit arp address:`	Enter the Address Resolution Protocol (ARP) address assigned by your SMDS service provider.	

Running the Quick-Start Script

To quick-start a BayStack router, you run the *install.bat* (AN/ANH) or *inst_arn.bat* (ARN) Technician Interface script, and respond to the prompts. The router automatically selects options for some prompts, and you can accept default values for many of the other prompts. You run the script as part of the Local Boot process.

To perform the Quick-Start procedure:

1. **Make sure that you have the completed worksheets with you.**
2. **Start the BayStack router.**
3. **At the Technician Interface prompt, enter Manager to log in.**

Note: Manager is case-sensitive; use an uppercase M.

The Technician Interface mounts the local file system and displays the command-line prompt.

4. **To ensure that the BayStack router is using the configuration file (*config*) on the local flash memory card, issue the getcfg command.**

   Look for the following line in the **getcfg** command display:

   ```
   boot config = local
   ```

If the line appears in the command display, proceed to step 5; otherwise, do the following:

a. **Enter bconfig config local.**

   For information about the **bconfig** command, see "Setting the Boot Configuration" in Chapter 4.

b. **Restart the BayStack router by entering boot.**

   The Technician Interface login prompt appears.

c. **Enter Manager to log in.**

   The Technician Interface command-line prompt appears.

5. **Enter dir to check the contents of the flash memory card.**

   The software image file (*an.exe* or *arn.exe*), configuration file (*config*), and Quick-Start script file (*install.bat* or *inst_arn.bat*) should appear among the files listed.

6. **Enter one of the following commands to start the Quick-Start script:**

   - For the AN/ANH:

     run install.bat

   - For the ARN:

     run inst_arn.bat

7. **Follow the script online.**

   See the list of Quick-Start commands in Table C-1.

Table C-1. Quick-Start Commands

Task	Action	Details
Accept a default value	Press [Return]	Your console displays default values in brackets; for example, [E11].
Repeat a step (for example, if you make a mistake)	Press [Control]-c; then, type **n**	When you press [Control]-c, the script prompts `Terminate script y/n?` Type **n** to return to the beginning of the step so that you can reenter the information.
Stop the Quick-Start procedure	Press [Control]-c; then, type **y**	When you press [Control]-c, the script prompts `Terminate script y/n?` Type **y** to terminate the procedure and return to the Technician Interface prompt. To restart the Quick-Start procedure, reboot the router by entering **boot**.

8. **Using your completed Quick-Start worksheets, enter the appropriate network information in response to the prompts.**

   The BayStack router uses this information to configure interfaces to the network.

   The script prompts you for information in this order:

   - The initial Global Information worksheet information
   - Specific protocol information
   - Wide area protocol selection
   - Specific protocol information
   - The rest of the Global Information worksheet information

   After you enter all of the Global Information worksheet and protocol information, the script displays a configuration summary and prompts you to save the configuration to a file.

9. **Save the configuration file.**

Note: If the BayStack router will use a routine startup procedure other than Directed Netboot, be sure to name the configuration file *config*.

The script begins to test the IP configuration (Figure C-1).

```
Testing local IP interface

ping -IP 192.32.00.000 -r5
IP ping:  192.32.00.000 is alive (size - 16 bytes)
IP ping:  192.32.00.000 is alive (size - 16 bytes)
IP ping:  192.32.00.000 is alive (size - 16 bytes)
IP ping:  192.32.00.000 is alive (size - 16 bytes)
IP ping:  192.32.00.000 is alive (size - 16 bytes)


This test attempts to ping the Site Manager workstation.

NOTE: If routing has not yet converged, an attempt
       to ping the Site Manager workstation may fail.  If
       this happens, you may either enter a new IP address or
       quit and wait a short period of time and try again from
       the TI command line.

Type q<return> to cancel this test.

Enter IP address of Site Manager workstation:
```

Figure C-1. Quick-Start IP Configuration Test

10. **To continue with the IP configuration test, enter the IP address for the Site Manager workstation.**

    To cancel the test, type **q**.

11. **For the ARN only, specify whether you want to configure another interface.**

    Type **n** to stop the Quick-Start script and return to the Technician Interface prompt.

    To configure another interface, type **y** to return to step 6.

12. **At the Technician Interface prompt, enter logout to exit the Technician Interface.**

After the router creates and tests the configuration, it starts using the information you entered to bridge and route traffic. To configure the router interfaces using Site Manager, see *Configuring and Managing Routers with Site Manager.*

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